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Vol. 26, No. 3

PSYCHOLOGICAL REVIEW PUBLICATIONS

March, 1929

Psychological Bulletin

EDITED BY

SAMUEL W. FERNBERGER, UNIV. OF PENNSYLVANIA

HOWARD C. WARREN, PRINCETON UNIVERSITY (*Review*)

RAYMOND DODGE, YALE UNIVERSITY (*Monographs*)

MADISON BENTLEY, CORNELL UNIVERSITY (*J. of Exp. Psych.*)

WALTER S. HUNTER, CLARK UNIVERSITY (*Index*)

HERBERT S. LANGFELD, PRINCETON UNIVERSITY, *Business Editor*

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HERBERT S. LANGFELD, PRINCETON UNIVERSITY, BUSINESS EDITOR.

WITH THE CO-OPERATION OF
MANY DISTINGUISHED PSYCHOLOGISTS

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containing original contributions only, appears bi-monthly, January, March, May, July, September, and November, the six numbers comprising a volume of about 500 pages.

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containing original contributions of an experimental character, appears bi-monthly, February, April, June, August, October, and December, the six numbers comprising a volume of about 500 pages.

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Vol. 26, No. 3

March, 1929

THE
PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE THIRTY-SEVENTH ANNUAL
MEETING OF THE AMERICAN PSYCHOLOGICAL
ASSOCIATION, INCORPORATED, NEW YORK, N. Y.,
DECEMBER 27, 28, 29, 1928.

REPORT OF THE RETIRING SECRETARY, SAMUEL W. FERNBERGER,
UNIVERSITY OF PENNSYLVANIA

The American Psychological Association, Inc., held its Thirty-seventh Annual Meeting at Columbia University, New York, N. Y., on Thursday, Friday and Saturday, December 27, 28 and 29, 1928. Five hundred and thirty-six persons registered, forty-seven more than were in attendance at the Columbus meeting last year, which up to that time was the record attendance. This registration was further remarkable with regard to the wide geographical distribution represented by those attending. In all, thirty-five states and six foreign countries were represented. An analysis of the registration by states and foreign countries is as follows: New York, 203; Massachusetts, 45; Pennsylvania, 44; Ohio, 39; Connecticut, 26; New Jersey, 24; Michigan, 21; Illinois, 20; Minnesota, 14; Maryland, 13; District of Columbia and North Carolina, each 8; New Hampshire, 7; England, 6; 4 each from Canada, Rhode Island, Maine and Virginia; 3 each from California, Florida, Iowa, Kansas and Missouri; 2 each from Arkansas, Germany, Indiana, Kentucky, South Carolina, Texas, West Australia, West Virginia and Wisconsin; 1 each from Alabama, Austria, China, Colorado, Oklahoma, South Dakota, Tennessee, Utah and Vermont.

The program consisted of ten formal sessions in which fifty-one papers were presented by members and associates and two sessions at which nineteen papers were presented by graduate students, six formally organized round table discussion groups, the Annual Dinner followed by the Presidential Address and two round table conferences

in experimental psychology arranged by Mr. Woodworth. Exclusive of the informal reports by graduate students, the fifty-one papers were classified by the Program Committee as follows: experimental psychology, 12; animal psychology, 10; 5 each for general and theoretical psychology, psychology of emotion, child psychology, mental tests and measurements, abnormal psychology; and educational psychology, 4. Formal round table discussion groups were held in clinical psychology, personality, the first course in psychology, consciousness and behavior, psychophysical measurement methods and esthetics. All of the sessions and round tables were largely attended.

The Annual Dinner was held on Friday evening with an attendance of approximately two hundred and fifty. Following the dinner, the Presidential Address, "The Psychology of Controversy," was given by E. G. Boring.

Apparatus was exhibited by a number of members and by the C. H. Stoelting Company.

A meeting of the Council of Directors was called at 10 o'clock on Wednesday morning, December 26, and was adjourned at 10 p.m. that same evening.

TRANSACTIONS OF THE ANNUAL BUSINESS MEETING

Due notice having been given, the annual business meeting of the American Psychological Association, Inc., was held on December 27, 1928, in Room 305, Schermerhorn Hall, Columbia University, New York, N. Y., at 8:05 p.m., with President E. G. Boring in the chair.

Upon motion duly made and seconded, it was voted that the minutes of the Thirty-sixth Annual Meeting at Columbus, Ohio, be approved as printed.

The Secretary announced that the American Psychological Association had been invited to participate in the Fourth Pacific Science Congress to be held at Batavia and Bandoeng, Java, May 16-25, 1929.

The Secretary announced the deaths of Bird T. Baldwin, on May 12, 1928, aged fifty-three years; Herbert B. Davis, on September 14, 1928; Henry Lane Eno, on September 10, 1928, and H. Norman Gardiner, on December 29, 1927, aged seventy-two years. The Secretary announced the resignations during the year 1928 of A. C. Armstrong, C. M. Bakewell, A. J. Culler, Grace M. Fernald, J. Franklin Messenger, Frank J. O'Brien, H. B. Reed and John W. Todd.

The Treasurer's report as printed on page 000 was read and approved by vote of the Association.

On the recommendation of the Council of Directors, it was voted to elect the sixteen persons named below as members of the Association.

List of Members

Transferred from Associate to Membership

- | | |
|---------------------------|-----------------------|
| 1. Chester W. Darrow | 5. Daniel E. Phillips |
| 2. Florence L. Goodenough | 6. Henry E. Starr |
| 3. Wilbur S. Hulin | 7. Ernest P. Wever |
| 4. Thos. N. Jenkins | |

New Applications

- | | |
|---------------------|--------------------------|
| 1. George T. Avery | 6. Christian P. Heinlein |
| 2. Harry R. DeSilva | 7. John R. Liggett |
| 3. Frances I. Gaw | 8. Miles A. Tinker |
| 4. Hans T. G. Hegge | 9. Lucien H. Warner |
| 5. Istar A. Haupt | |

On the recommendation of the Council of Directors, it was voted that the two hundred and six persons whose names were presented by the Council for election as Associates, be elected as Associates. Their names appear below:

- | | |
|------------------------------|--------------------------|
| 1. Donald K. Adams | 25. Edward N. Brush |
| 2. Richard D. Allen | 26. Marion E. Bunch |
| 3. Carl L. Altmaier, Jr. | 27. Barbara S. Burks |
| 4. Oscar D. Anderson | 28. Gonzalo B. Camargo |
| 5. Clairette P. Armstrong | 29. Robert P. Carroll |
| 6. William R. Atkinson | 30. Harold D. Carter |
| 7. Eva R. Balken | 31. M. E. Carver |
| 8. Bernice E. Barrows | 32. Psyche Cattell |
| 9. Herbert Barry | 33. Sperrin N. F. Chant |
| 10. James E. Bathurst | 34. Lucile E. Chase |
| 11. Thomas L. Bayne, Jr. | 35. Stanley F. Cooper |
| 12. Esther Beckwith | 36. Stuart A. Courtis |
| 13. Violet G. Bemmels | 37. Noel B. Cuff |
| 14. Anna E. Biddle | 38. Bess V. Cunningham |
| 15. Fern B. Black | 39. John P. Currie |
| 16. David P. Bodner | 40. Lois E. Curry |
| 17. Euri B. Bolton | 41. Emily S. Dexter |
| 18. Sister Jeanne M. Bonnett | 42. Gladys R. Dunkle |
| 19. Paul L. Boynton | 43. Sol. R. Eilert |
| 20. Charles W. Bray | 44. Adolph G. Ekdahl |
| 21. Willard H. Brentlinger | 45. Naomi M. G. Ekdahl |
| 22. Katherine M. B. Bridges | 46. Anna S. Elonen |
| 23. Adelaide F. Brown | 47. Frank O. Eppright |
| 24. Clarence W. Brown | 48. George H. Estabrooks |

49. Mary B. Eyre
50. Hanna Faterson
51. Shammai Feldman
52. Vivian E. Fisher
53. Edwin G. Flemming
54. Helen L. Flinn
55. Ilse Forest
56. Frank S. Freeman
57. Gladys D. Frith
58. Martin F. Fritz
59. Lawrence H. Gahagan
60. Karl C. Garrison
61. Chester R. Garvey
62. Frank A. Geldard
63. Joseph A. Gengerelli
64. Marian McD. Geohegan
65. James J. Gibson
66. Emma G. Gilbert
67. Frank R. Gillespie
68. Joseph C. Glose, S.J.
69. Crawford L. Goldthwait
70. Carter V. Good
71. James L. Graham
72. David Grauer
73. James E. Greene
74. Fred M. Gregg
75. Tallmadge Griffin
76. Herbert Gurnee
77. Dorothy K. Hallowell
78. Edna L. Hamilton
79. Hughbert C. Hamilton
80. Hazel I. Hansford
81. John R. Hart, Jr.
82. George W. Hartmann
83. Gordon Hendrickson
84. Kate Hevner
85. Myra E. Hills
86. Howard T. Hovde
87. Edna V. Howell
88. Ruth M. Hubbard
89. John F. Humes
90. Thelma Hunt
91. Richard W. Husband
92. Paul E. Huston
93. Otis C. Ingebritsen
94. Francis W. Irwin
95. Carlyle F. Jacobsen
96. Marion M. Jacobsen
97. John G. Jenkins
98. Arthur T. Jersild
99. Olson Johnson
100. Theodore F. Karwoski
101. Fred. S. Keller
102. Winthrop N. Kellogg
103. Jacob C. Kelson
104. Adam P. Kephart
105. Mabel G. Kessler
106. George Kreezer
107. William C. F. Krueger
108. Theo A. Langlie
109. William S. Larson
110. Prescott Lecky
111. Timothy T. Lew
112. Sarah M. Light
113. Ernest M. Ligon
114. Chauncey McK. Louttit
115. Harold M. Lufkin
116. William F. Lutz
117. Donald W. MacKinnon
118. Andrew H. MacPhail
119. Charles W. Manzer
120. Helen Marshall
121. Elizabeth H. Marston
122. Pauline R. Martin
123. Anna Mathiesen
124. Elton Mayo
125. Walter G. McAllister
126. Ellen A. McAnulty
127. Dorothea A. McCarthy
128. Eugene F. McCarthy
129. Selinda McCaulley
130. William E. McClure
131. Ross A. McFarland
132. Grace O. McGeoch
133. Esther McGinnis
134. Marie H. Means
135. Grace E. Munson
136. Miles S. Murphy
137. Robert W. Nafe
138. Yale S. Nathanson
139. Dorothy B. Nyswander
140. Vera Overschelp
141. Charles L. Odom
142. Everett F. Patten
143. Charles R. Pendleton
144. Nellie L. Perkins
145. George M. Peterson
146. D. McL. Purdy

- | | |
|-------------------------------|--------------------------|
| 147. Clarence E. Ragsdale | 177. James B. Stroud |
| 148. Hermann H. Remmers | 178. Dorritt Stumberg |
| 149. Nina A. Ridenour | 179. Keith Sward |
| 150. Alfred R. Root | 180. Edith F. Symmes |
| 151. George H. Rounds | 181. Helen Thompson |
| 152. Grace P. Rush | 182. J. Warren Tilton |
| 153. Paul H. Saleste | 183. Otto L. Tinklepaugh |
| 154. Sidney Sanderson | 184. Otis C. Trimble |
| 155. Peter E. Schellenberg | 185. Dorothy Triplett |
| 156. Harold Schlosberg | 186. William D. Turner |
| 157. Emmett L. Schott | 187. Edward M. Twitmeyer |
| 158. Gladys C. J. Schwesinger | 188. Richard S. Uhrbrock |
| 159. Carleton F. Scofield | 189. Genette Ulvin |
| 160. Thurman C. Scott | 190. Ruth Updegraff |
| 161. Dorothy W. Seago | 191. Morgan Upton |
| 162. Charles A. Selzer | 192. James Vaughn |
| 163. David Shakow | 193. J. Ellis Voss |
| 164. Winford L. Sharp | 194. Sibul Walcott |
| 165. Mandel Sherman | 195. Fred C. Walters |
| 166. Myra E. Shimberg | 196. H. LaVinia Warner |
| 167. Mary M. Shirley | 197. Goodwin B. Watson |
| 168. Irvin T. Shultz | 198. Homer E. Weaver |
| 169. Therman K. Sisk | 199. Blanche C. Weill |
| 170. Charles S. Slocombe | 200. Martin M. White |
| 171. Richard C. Sommerville | 201. Paul LeR. Whitely |
| 172. Ralph B. Spence | 202. Harold M. Williams |
| 173. John M. Stalnaker | 203. Herbert D. Williams |
| 174. Samuel N. Stevens | 204. William I. Woodson |
| 175. Edward G. Stoy | 205. Edgar L. Yeager |
| 176. Frederic O. Stredder | 206. Mary H. Young |

The report of the Committee on the Election of Officers was then presented as follows:

President for 1929: K. S. Lashley, Institute for Juvenile Research.
Directors, 1929-1931: Albert P. Weiss, Ohio State University,
and Herbert H. Woodrow, University of Oklahoma.

Nominees for appointment to the Division of Anthropology and
Psychology of the National Research Council: Samuel W.
Fernberger, University of Pennsylvania, and Walter Miles,
Stanford University.

Representative on the Social Science Research Council: Floyd H.
Allport, Syracuse University.

On the unanimous recommendation of the Council of Directors,
it was voted to elect Carl C. Brigham of Princeton University, Secretary
for the term 1929-1931.

On the recommendation of the Council of Directors, it was voted

to elect the following representatives of the American Psychological Association, Inc., on the Council of the American Association for the Advancement of Science: W. V. Bingham, Personnel Research Federation, and R. M. Ogden, Cornell University.

On the recommendation of the Council of Directors, it was voted that the report of the Committee on Precautions in Animal Experimentation be accepted, printed in the Proceedings and its provisions adopted, including an appropriation of fifty dollars (\$50) to enable the Committee to put into effect certain proposals embodied in the report. It was further voted that the Committee be continued.

On the recommendation of the Council of Directors, it was voted that the report of the Program Committee be accepted and printed in the Proceedings.

On the recommendation of the Council of Directors, it was voted that the report of the Committee on Handbooks in Psychology be accepted, filed with the Secretary and the committee discharged. After considerable discussion, the following recommendation of the Council of Directors was lost. That the Council of Directors approves the recommendations of the committee and of the conference of Editors and Business Managers of Anthropological and Psychological Journals to the effect that "this conference approves in principle the publication of a series of monographs, each covering a digest of the literature in a given topic in Psychology; and recommends that this expression of opinion be called to the attention of the business meeting of the American Psychological Association" and further recommended that the incoming President appoint a committee of five to attempt to obtain the necessary subvention and proceed with the plan of publication and that the sum of one hundred dollars (\$100) be appropriated for this purpose.

A motion that the recommendations of the Council of Directors of the American Psychological Association be reported to the Division of Anthropology and Psychology of the National Research Council as the opinion of the Association was withdrawn. It was voted, 43 for and 40 against, that the American Psychological Association, Inc., endorses the recommendation of the Conference of Editors and Business Managers of Anthropological and Psychological Journals and that the Secretary be instructed to transmit a copy of this resolution to the Chairman of the Division of Anthropology and Psychology of the National Research Council. It was voted that the vote on the preceding motion be recorded, transmitted to the Chairman of the

Division of Anthropology and Psychology of the National Research Council and printed in the Proceedings.

On the recommendation of the Council of Directors, it was voted to accept the report of the Business Manager of the Psychological Review Publications and that it be filed with the Secretary.

Informal reports of progress were made by the Chairman of the Division of Anthropology and Psychology of the National Research Council; by Mr. Woodworth for the Social Science Research Council and by the Editor of the Psychological Abstracts. The Editor of the Psychological Abstracts also reported that the committee had approached the Laura Spelman Rockefeller Memorial for an increased subsidy for the Psychological Abstracts and that this had been refused.

On the recommendation of the Council of Directors, it was voted to accept the report of the Auxiliary Committee on Method in the Social Sciences of the Social Science Research Council and that it be filed with the Secretary.

A motion to have the Association instruct the incoming president to appoint a committee of fifteen members to work on the problem of trying to reach an agreement with respect to ideas which should be fulfilled by a first course of psychology and that this committee shall have unlimited powers of resolving itself into sub-committees and also unlimited powers of adding to its personnel such other members of the Association as it may desire, was lost.

At the request of the National Committee of the Ninth International Congress of Psychology, the recommendation of the Council of Directors that the meetings of the American Psychological Association be omitted in December, 1929, with the understanding that arrangements will be made by the Ninth International Congress of Psychology to receive the Presidential Address of the American Psychological Association was approved. The Secretary was subsequently assured that the Ninth International Congress for Psychology would make the proper arrangements for the Presidential Address.

On the recommendation of the Council of Directors, inasmuch as the American Psychological Association has voted to omit the annual business meeting in 1929, those portions of the By-Laws relative to the annual meeting be suspended for the year 1929 and that the Council of Directors be empowered to proceed with the election of new Members and Associates; in passing the budget for 1930, in making the arrangements for the 1930 meeting of the

Association, with receiving reports of committees and with any other routine business of the Association which may come before it and that the minutes of this meeting shall be published as usual in lieu of the Proceedings of the annual meeting, was approved.

The recommendation of the Council of Directors that the American Psychological Association appropriate the sum of one thousand dollars (\$1,000) to the Ninth International Congress of Psychology to be expended as the National Committee may deem fit was approved.

The recommendation of the Council of Directors that the Secretary of the Association provide an extra supply of Year-Books of the Association to be purchased by departments of psychology and by graduate students at fifty cents each was approved.

The recommendation of the Council of Directors that because of the present size of the Association, the annual dinner be henceforth omitted and that an evening meeting for the Presidential Address and an informal smoker be continued was approved.

The recommendation of the Council of Directors that the American Psychological Association do not meet with the American Association for the Advancement of Science in 1930 was approved.

A motion to change the By-Laws of the American Psychological Association, Inc., as is hereafter indicated was approved. That Article XII of the By-Laws of the American Psychological Association be amended by adding the following clause to the Article "and that no person may be an Associate of the Section of Clinical Psychology who is not also an Associate of the American Psychological Association", making the Article read as amended: "There shall be within the Association a Section of Clinical Psychology which shall determine its own organization and membership, subject only to the approval of the Association as a whole, provided however, that no person may be a Member of the Section of Clinical Psychology who is not also a Member of the American Psychological Association and that no person may be an Associate of the Section of Clinical Psychology who is not also an Associate of the American Psychological Association."

A motion that in arranging future meetings of the American Psychological Association, the Secretary arrange directly with the Railway Companies for a convention rate on the certificate plan was referred to the Council of Directors with power to act.

The Treasurer presented the estimate of resources and the budget for 1929 as printed on page 000. On the recommendation of the Council of Directors, the budget was adopted.

Upon motion duly made and seconded, it was voted to thank Columbia University for its generous hospitality and the many courtesies extended during the meetings, and to thank Professor Garrett and the Local Committee for the excellent manner in which all arrangements were carried out.

The meeting adjourned at 10:12 P.M.

AMERICAN PSYCHOLOGICAL ASSOCIATION, INCORPORATED
REPORT OF THE TREASURER FOR THE YEAR 1928

Dr.

To Balance from previous year.....	\$6,357.25
Dues received from Members and Associates.....	6,478.75
Sale of Monographs	12.17
Sale of programs	35.18
Interest	59.27
<hr/>	
Total	\$12,942.62

Cr.

To Printing and supplies	\$239.97
Postage and express	171.43
Reprints	120.52
Yearbooks	350.53
Proceedings (Abstracts).....	222.37
Incidentals, 1927 meetings	25.00
Treasurer's bond, and safety deposit box.....	12.50
Payment on Review Publications.....	500.00
Interest on notes, Review Publications, 1927.....	175.00
Refund of certification fees.....	172.27
Program Committee	16.20
Committee on Animal Experimentation.....	11.54
Subscription to Psychological Abstracts.....	1,998.00
International Congress	1,000.00
Secretary's stipend	1,000.00
Treasurer's stipend	100.00
<hr/>	
Total	6,115.33
<hr/>	
Balance on hand	\$6,827.29

ACCOUNT OF CERTIFICATION COMMITTEE

Dr.

To Balance from previous year.....	\$490.73
Interest	2.00
Transfer from American Psychological Association.....	32.27
<hr/>	
Total	525.00

Cr.	
To Refund of 15 certification fees at \$35.00 each.....	\$525.00
Total	525.00
	\$ 000.00

NEW HAVEN, CONNECTICUT
December 15, 1928

EDWARD S. ROBINSON,
Treasurer

Audited and found correct by
H. C. BINGHAM and
MARK A. MAY

AMERICAN PSYCHOLOGICAL ASSOCIATION, INC.
Budget for 1929

Printing and supplies.....	\$400.00
Postage and express.....	300.00
Reprints	150.00
Year Book	400.00
Proceedings (Abstracts)	300.00
Incidentals, 1928 meeting.....	60.00
Apparatus exhibit	50.00
Treasurer's Bond and Safety Deposit Box.....	12.50
Payment on Review Publications.....	1,000.00
Interest on Review Publications.....	150.00
Committee on Animal Experimentation.....	50.00
Subscriptions to Psychological Abstracts.....	2,550.00
International Congress	1,000.00
Secretary's stipend	1,000.00
Treasurer's stipend	100.00
	\$7,522.50

REPORT OF THE COMMITTEE ON PRECAUTIONS IN ANIMAL
EXPERIMENTATION

During the year 1928 the Committee on Precautions in Animal Experimentation has accomplished at least two things: (1) We have printed and distributed a letter to persons engaged in animal experimentation describing the need of precautions in the treatment of laboratory animals (copy enclosed under date February, 1928) and with this we have sent the Code of Rules adopted by the American Psychological Association regarding humane treatment of experimental animals. The letter and Code were sent to 66 of the laboratories represented in the Year Book of the American Psychological Association as engaged actually or potentially in experimental

work with animals. The Committee has also met several requests for additional copies. (2) We have prepared and printed in the *Psychological Bulletin*, August, 1928, a note regarding the work and purposes of the Committee. Offprints of this note are on hand and will be furnished upon request (copy enclosed).

Regarding the future usefulness of the Committee we agree: (1) That freshly printed copies of the Code of Rules be sent to laboratories engaged in animal experimentation once in every two years to replace those that become lost or defaced. (2) That notes be printed from time to time dealing with such matters as the need of protecting animal experimentation, the agencies at work in this field, the aims of the Committee on Precautions in Animal Experimentation, etc. (3) That the Committee should not be aggressive unless an unforeseen crisis should arise.

The Committee would like to remind members of the American Psychological Association that published accounts of animal experimentation, whether in the form of original articles or reviews, should be free so far as possible from statements objectionable to members of a humane society. During the present year there have been several violations of this principle.

It is recommended that the sum of fifty (\$50.00) dollars be set aside for the purposes of the Committee. This has been the amount of the budget for the present year. The total expenses of the Committee for printing and postage in 1928 have been less than \$15.00, an exact account being in the hands of the Treasurer of the American Psychological Association who has received and paid all bills.

E. C. TOLMAN

R. M. YERKES

PAUL T. YOUNG, *Chairman*

REPORT OF PROGRAM COMMITTEE

The chief task of the Program Committee, and its most disagreeable one, is that of selecting and rejecting papers from among the large number offered in a given year. The Committee wishes it to be known that a full day is spent by the Committee in the organization of the program, in addition to the considerable amount of time given by the Secretary, both before and after.

Effort is made to plan a unified program, along the lines most fully represented in the papers offered. To this end papers must be rejected for various reasons which may have no reference whatever

to the worth or interest of the paper considered by itself. If the program is to be limited to its present size, nine or ten sessions with five papers each, about one-third of the papers offered cannot be included. Grounds of rejection most employed are—

- Lateness of submission
- Absence of abstracts
- Vagueness of abstracts
- Relevance to other papers, with which a topical session can be arranged
- Absence of other papers affording a topical series for a program session
- The frequency with which the writer has recently appeared on the program of the Association
- Availability of other places of report,—as Round Tables, Conferences, Apparatus Exhibit
- If too many papers still remain after elimination on such grounds, effort must be made to evaluate the probable relative interest and importance of those competing for a given session. If this is necessary it is always done with reluctance and after careful joint reading and discussion of the abstracts.

Choice must be made between an indefinitely crowded and unorganized program, and one of the organized and limited kind, with some responsibility assumed by the Program Committee. The present committee was charged to adopt the latter method, by way of trial. It believes the results to be in general satisfactory, and recommends the continuance of the experiment with the selective method, if committees can continue to be found who will bear the burden and the occasional blame. It also urges that offering of papers in large numbers should be encouraged, with the clear understanding of the grounds of selection and rejection, for only in this way can a coherently organized and limited program be arranged.

H. L. HOLLINGWORTH, *Chairman*

LIST OF PAPERS

(Arranged alphabetically by Authors)

1. Henry F. Adams, A Technique for Determining an Objective Subjectivity Ratio for Scales of Measurement.
2. Grace Arthur, The Standardization of a Point Performance Scale.
3. Key Lee Barkley, An Experimental Method for Determining the Relative Efficiency of Magazine Advertisements.
4. Herbert Barry, The Measurement of Individual Differences in Group Suggestibility.
5. Harold C. Bingham, Selective Adaptations of Chimpanzees.
6. H. G. Bishop, Visual Experience and Perception of Space.
7. W. E. Blatz, A Comparison of the Behavior of Human Subjects and Chimpanzees in Similar Controlled Situations.
8. C. C. Bunch, Age Variations in Auditory Acuity.
9. Matthew N. Chappell, Are There Characteristic Changes of Blood Pressure in Deception?
10. Elmer Culler, Function of Cutaneous Muscle in the Perception of Cold.
11. Chester W. Darrow, The Galvanic Skin-Reflex, Not a Vasoconstrictor Phenomenon.
12. G. V. N. Dearborn, Mental Deterioration.
13. Walter F. Dearborn, The Aetiology of So-Called Congenital Word-Blindness.
14. Forrest L. Dimmick, An Experimental Study of Some of the Conditions of the Visual Perception of Movement.
15. Franklin Fearing, An Experimental Study of the Effect on the Knee-Jerk of Coincident Psychomotor Action.
16. Frank N. Freeman (with the collaboration of Karl J. Holzinger and H. H. Newman), The Resemblance of Identical and Fraternal Twins in a Variety of Traits.
17. Paul Hanly Fursey, A Scale for Measuring Developmental Age.
18. Robert H. Gault, On the Effect of Tactual-Visual Stimulation in Relation to the Interpretation of Speech.
19. Arnold Gesell, The Influence of Maturation on Infant Behavior Patterns.
20. W. D. Glenn, Jr., The Inheritance of Defect in General Intelligence Measured by the Method of the Individual Psychological Examination.
21. Florence L. Goodenough, The Relative Potency of Form and Color Perception at Various Ages.
22. Coleman R. Griffith, Timing as a Factor in Athletic Skills.
23. Martha Guernsey, A Quantitative Study of the Eye Reflexes in Infants.
24. Starke R. Hathaway, An Improved Pendulum Chronoscope.
25. Edna Heidbreder, Preferences and Self Rating.
26. Harry Helson, The Effects of Direct Stimulation of the Blind Spot.

27. George Humphrey, The Conditioned Response and "Acclimatization to Stimuli" in Animals.
28. W. S. Hunter, The Problem of the Insoluble Maze.
29. Eliot D. Hutchinson, The Technique of Creative Thought.
30. S. Isaacs and E. B. Saunders, Tests of Reaction Time and Motor Inhibition in the Psychoses.
31. Granville B. Johnson, The Influence of Periodicity on Learning to Walk a Tight Wire.
32. Polyxenie Kambouropolou, Studies in the Sense of Humor of One Hundred Vassar Students.
33. J. R. Kantor, An Anthropological Basis for Psychology.
34. W. N. Kellogg, An Experimental Comparison of Psychophysical Methods.
35. Heinrich Klüver, Relational Thinking in Monkeys.
36. Carney Landis, The Place of the Psychogalvanic Reflex in Psychology.
37. Howell Lewis, Configurational Response in a Chick.
38. H. S. Liddell and O. D. Anderson, Preliminary Results of Physiological Analysis of Learning.
39. Inez Verne Love, The Validity of Self-Estimated Academic Grades of Eleven Hundred and Sixty-five University Students.
40. Frederick H. Lund, Why Do We Weep?
41. William M. Marston, Bodily Symptoms of Elementary Emotions.
42. J. H. McFadden, The Relationship of the Order of Birth to Variation in Levels of Intelligence of Siblings.
43. John A. McGeoch and Arthur W. Melton, The Comparative Retention Values of Maze Habits and Nonsense Syllables.
44. Milton Metfessel, The Vibrato in Artistic Voices.
45. Walter Miles, Effect of Endocrine Substances on Memory Habit in the Rat.
46. Henry W. Nisson, Influence of the Gonads on the Sex Drive of the Albino Rat as Measured by the Obstruction in Method.
47. James R. Patrick, The Effect of Emotional Excitement on Rational Behavior as Demonstrated by the Quadruple-Choice Method.
48. Joseph Peterson and W. F. Smith, The Range of Consonance in Certain Musical Intervals.
49. James P. Porter, The Psychogalvanic Compared with Other Measures of Emotional Reactions.
50. Carroll C. Pratt, The Spatial Character of High and Low Tones.
51. Morton Prince, Why We Have Traits—The Theory of Integration of Dispositions.
52. E. M. Riddle, Habits of Sustained Effort.
53. Curt Rosenow, A Theory of Hysteria.
54. John F. Shepard, An Unexpected Cue in Maze Learning.
55. Anna Spiesman Starr, The Significance of the Ratio Maintained Between the Forward, Reverse and Rhythmic Memory Span as Obtained in Three Thousand Individual Examinations.
56. C. P. Stone, The Age Factor in Rat Learning.
57. George M. Stratton, Emotion and the Incidence of Disease: The Number of Diseases, and the Age at Which They Occur.

58. Percival M. Symonds and Doris Harter Chase, The Relative Influence of Practice vs. Motivation on Learning.
59. Lee Edward Travis, A Neurophysiological Envisagement of Intelligence.
60. Dorothy Triplett, A Preliminary Report on the Temporal Perception of Short Intervals.
61. W. D. Turner, The Psychology of the Successive Comparison-Judgment.
62. Austin H. Turney, Factors Affecting Achievement in the High School.
63. J. E. W. Wallin, Margery Gilbert Cutsforth, A Statistical Study of the Responses to the Individual Tests in the Stanford-Binet for Examinees of Different Chronological and Binet Ages and Diagnostic Groupings.
64. C. J. Warden, Primacy and Recency Factors in Animal Motor Learning.
65. Mae Warfield, Intelligence Factors in Religious Training of Seventh Grade Pupils.
66. Margaret Floy Washburn, Energy, Engines and the Engineer.
67. George Edward Weigand, Motility Studies of Sleep in Functional Neuroses.
68. Raymond H. Wheeler, Behavior and the Law of Least Action.
69. A. L. Winsor, A Study of Conditioned Salivary Responses in Man.

ABSTRACTS OF PAPERS

PROGRAM A

GENERAL PSYCHOLOGY

THURSDAY, DECEMBER 27, 9:30 A.M.

ROOM 305, SCHERMERHORN HALL

M. W. CALKINS, *Chairman*

An Anthropological Basis for Psychology. J. R. KANTOR, Indiana University.

The writer proposes that the close affiliation of psychology with the data and principles of anthropology will result in scientific advancement parallel to that which occurred when the psychologist began to base his science on physiological ground. It is to be recalled that it was through the absorption by psychology of the physiological investigations of Weber and Helmholtz that psychology first became a science. Not until the psychologist affiliated himself with the physiologist did he look upon his data, in part at least, as definite events in nature. This is the period in which was introduced that most valuable scientific conception of an organism interacting with its surroundings. Unfortunately, however, the benefits of the physiological conception were not unalloyed with disadvantages. Indeed, it brought into the field of psychology numerous difficulties; for example, the mind-body problem. This problem carries within it a dilemma gravely antagonistic to the interests of scientific psychology. On the one hand, it makes psychology concern itself with intangible processes which must be defined as transspatial. Now obviously the data of psychology cannot be thoroughly scientific as long as the physiological organism has to be involved with mentalistic factors. On the other hand, the extrusion of psychic factors from psychology leaves numerous gaps in its data. The cultivation of the psycho-physiological conception has therefore reached a point of decidedly diminishing returns. Furthermore, numerous recent neurological investigations (among them those revealing the complete invalidity of cerebral localization) indicate the need to supplement and correct the physiological materials in psychology. On the basis merely of anatomical structure and physiological functions we cannot adequately describe the details of psychological occurrences nor

explain such phenomena. The writer submits that anthropological studies will complete the scientific character of psychology. In the first place, taking account of the humanistic development of organisms and of the way behavior traits are engendered will do away entirely with the mind-body problem and enable us to describe the physiological components of psychological events in the way that they actually occur. In addition, anthropological studies will aid us to comprehend the things and situations to which psychological adjustments are made, as well as throw light upon the details of the adaptational interactions of organisms and their stimuli. The viewpoint suggested here is illustrated by a reference to linguistic phenomena.

Behavior and the Law of Least Action. RAYMOND H. WHEELER,
University of Kansas.

Changes in the philosophical and logical presuppositions upon which psychological theory is based now make it possible to interpret behavior in terms of functional principles like those in use in the other sciences. The law of least action is perhaps the most basic of these functional principles and is implied in the concept of configurational response. The configurationists have been leaders in the application of the principle to problems in behavior. Various parallels are drawn between (1) events as studied by the physicist and (2) different modes of human behavior. The possibility is stressed that (1) directional activity of parts in a physical system of energy, like a body falling in a gravitation system, and (2) purposeful human behavior, stand at the two extremes of a range of events which differ only in degree, not in kind.

The following modes of behavior are interpreted in terms of the law of least action: 1. Social behavior, including the interaction between groups and between individuals and the group. 2. Intelligent behavior in animals and human beings, including the question of goal activity and the problem of imagery in animals. 3. Emotion. This application of the theory is suggested in place of the customary James-Lange and Crile types of interpretation on the one hand, and the notion of urges and defense mechanisms on the other. 4. Learning. Includes a critical comment on the psychology of motivation and on the principle of trial and error learning. 5. The functioning of relatively isolated muscular groups, such as are involved in eye movements. 6. Typical perceptions and sensory processes. 7. Functioning of the nervous system.

The question is raised as to whether this is a mechanistic interpretation of behavior, which is answered in the negative.

Energy, Engines, and the Engineer. MARGARET FLOY WASHBURN,
Vassar College.

Spearman in *The Abilities of Men* interprets general cognitive ability or "g," which is shown in "eduction" or the cognition of relations, as due to the individual's quantity of mental energy; group and special abilities as due to peculiarities of the engines, central and peripheral, through which this energy works; and the general conative factor, self-control, as possibly due to the activity of an engineer. The writer of the present paper would reject both the concept of a nonphysical engineer and that of a mental energy not identical with nervous energy, as needlessly mystical. This paper deals with the second concept, and aims to show that in explaining "g," or general cognitive ability, the assumption of a peculiarity of the cortex, the general central engine, is preferable to that of a certain quantity of mental energy. Spearman acknowledges with regret that his "mental energy" is not in harmony with our present knowledge about physical energy. He nowhere states the differences, but the present writer would suggest that they are as follows: the person with most "g," which is manifested only in the cognition of relations, is neither the person with most nervous energy in subcortical processes, that is, the most emotional person, nor the person with most cortical nervous energy, for we have no reason to suppose that cortical energy is not involved in reproductive as well as in eductive processes, and Spearman's "g" is not correlated with memory. Since "g" correlates only with the cognition of relations, one would more naturally conceive it as based not on quantity of energy, nervous or mental, but on a certain constitution of the cortex allowing delicacy of response and the analysis of situations. Spearman's chief reason for identifying "g" with quantity of mental energy lies apparently in the phenomenon of mental span, the fact that there is a limit to the number of mental processes that can occur together; a phenomenon which suggests the conservation of physical energy. But examination of Spearman's data shows that mental span as such does not correlate with "g" at all. The correlation appears only when mental span is based on eduction or the cognition of relations, and this, as has just been suggested, is more plausibly conceived as based on delicacy of response in the cortical engine than on quantity of energy.

The Technique of Creative Thought. ELIOT D. HUTCHINSON, University of Rochester.

This paper, abstracted from a book shortly to be published, is the summary of work done under the National Research Council at the University of Cambridge, England. Two problems for discussion are briefly proposed: first, a comparative study of the creative methods and practices of four groups—artists, authors, scientists, and musicians. The discussion is based on material gathered from personal interviews with, or written comments from, some of the most famous of present-day British and American thinkers: Authors such as Arnold Bennett, James Matthew Barrie, William Butler Yeats, Ian Hay, Eden Phillpotts, E. Phillips Oppenheim, W. Somerset Maugham, Aldous Huxley, etc.; scientists such as Bertrand Russell, Sir J. Flinders Petrie, B. Malinowski, J. A. Fleming, Donald Gamgee, C. Elliot Smith, *et alii*; artists such as Sir W. Gascomb-John, Sir A. S. Cope, Sir Edwin L. Lutyens; musicians such as Aylmer Buesst, etc. The second problem proposed is a study of creative work done under hypnosis with an attempt to elucidate the subconscious mechanism of productive thought. Creative thought is divided into four periods for the convenience of discussion: (1) the period of intimation or incubation, (2) the period of illumination, (3) the period of inspiration, and (4) the period of verification. The characteristics of creative ideas which appear in consciousness argue that the moment of inspiration in which brilliant ideas flash into mind is really a period of mental dissociation caused either by emotion, or absorption in other interests. Such creative ideas usually appear when the interest is absorbed by irrelevant matters, are usually fragmentary, often immediately unrelated to the problem in hand, are usually discovered on the fringe of consciousness, irrecoverable when lost, are sudden in appearance, sweep over the mind in a flood, develop supplementary or alternate forms, and display impersonality—all characteristics of ideas which appear in a moment of dissociation. In a series of experiments on the production of creative literary work, poetry, etc., while the subject is under the influence of hypnosis, this theory is tested. Inspirations, or what are introspectively their equivalents, are controlled experimentally, and the subconscious mechanisms noted. The paper is intended to be a contribution both to the fact and theory of a much-neglected field of psychology.

Why We Have Traits—The Theory of Integration of Dispositions.
MORTON PRINCE, Harvard University.

From a descriptive point of view personality is the sum total of its traits—What are traits? All writers do not mean the same thing by them—Classification of traits from a descriptive point of view; preliminary and secondary traits—Concrete illustrations from historical characters—Pathological traits—Traits as springs of action—Study of human nature resolves itself into a study of traits—Traits and personality as conceived by writers of fiction—Psychological definition of traits in terms of behavior—if “behavior” is taken in the narrow sense of objective behavior this definition is too narrow, on the other hand if behavior is used in a more comprehensive sense to cover mental reactions as well as bodily reactions a behavioristic definition becomes adequate—Psychologically a trait may be defined as an habitual mental reaction characteristic of the individual to an actual or ideal situation—Traits are characterized by being obstinately persistent and enduring—They can, however, be modified or eliminated by experience and replaced by others of an opposite character—Why do traits endure and why do we have them at all? No behavioristic account can answer these questions—The theory of integration of dispositions—Personality has a structure comparable to that of the nervous system—Personality considered as a composite structure built upon a foundation of preformed inherited psychophysiological dispositions (instincts, etc.) by experience—Inherited and acquired dispositions—The infant little more than an instinctive and reflex Robot but differs from a mechanical Robot in that it acquires experience and thus the responses of its mechanisms to specific situations become modified—How the organism acquires experience—Thus we have the formation of new structural mechanisms manifested as traits—The theory of personality based on these principles—Mode of integration of acquired dispositions—in the last analysis a disposition is physiological—The theory discussed explains why we have traits, their persistence and why they cannot be changed at will, etc.

ROUND TABLE DISCUSSION
CLINICAL PSYCHOLOGY

THURSDAY, DECEMBER 27, 9:30 A.M.
ROOM 401, SCHERMERHORN HALL
H. T. WOOLLEY, *Chairman*

PROGRAM B
EXPERIMENTAL PSYCHOLOGY
THURSDAY, DECEMBER 27, 10:00 A.M.
ROOM 301, FAYERWEATHER HALL
R. S. WOODWORTH, *Chairman*

The Vibrato in Artistic Voices. MILTON METFESSEL, University of Iowa.

The vibrato is that faint, regular pulsing of the voice with an average rate of seven pulses per second. Its appearance in voices of recognized artists is almost universal, whereas in a general adult population it occurs in about one out of every five. This study has been chiefly confined to those of its motor and auditory characteristics which are related to pitch. Measurements of frequency of vibration in the sound wave constitute the bulk of the material, and these measurements have been related to neuromuscular causes (in collaboration with Chester H. Leese) and pitch effects. The measurements have been made automatically by the strobophotograph, which does photographically with frequency of vibration what stroboscopy did visually but with greater facility, detail and permanence. A summary of the results will be presented on the following phases of the study: (1) Norms of beauty of operatic artists in terms of rate, extent, and form of oscillation, compared with norms of university music students; (2) significance of the perception of a single salient pitch to beauty of the vibrato; (3) distinction from tremolo and trill; (4) effect of excitement on the vibrato; (5) the vibrato in the expression of calm and excited emotions; (6) effect of training and modifying the vibrato (with A. H. Wagner); (7) sex differences in its appearance; (8) comparison in voices of musically untrained Negroes and whites (with Guy B. Johnson), and (9) indirect evidence in the analysis of the vibrato pulsations into variations of wave-energy and wave-form as well as frequency of vibration (with J. H. Tiffin).

Age Variations in Auditory Acuity. C. C. BUNCH, Johns Hopkins University.

It is quite generally conceded that auditory acuity diminishes with advancing age. The amount of loss, its character and cause are debatable. The following study was conducted to secure evidence

toward the solution of these problems. The observers selected were patients in the medical and surgical departments of Johns Hopkins Hospital. They were not "ear cases" as such. In fact, the records of those acknowledging a loss of auditory acuity have been eliminated from the results, with one exception. Elderly people, when asked as to their hearing ability frequently respond, "My hearing may not be as acute as it was when I was young but I think it as good as any one has at my age." The Western Electric 1A Audiometer, with its fixed range of tones and its calibrated intensity scale, was selected as being most adaptable as a sound source for this study. The results secured from three hundred fifty-three observers over twenty years of age were divided according to decades and the group mean for each tone calculated. The results indicate: first, that all groups hear the octave tones below 512 d.v. with almost equal acuity; second, that the acuity for tones above this pitch decreases with each successive decade. The loss at 1,024 d.v. is not great. At 2,048 d.v. it is distinct, and is quite marked for 4,096 d.v. and tones of higher pitch. It is not contended that these are normal observers. It is thought, however, that the elimination of the records of those avowedly hard of hearing gives results which represent a sampling of the auditory acuity of our population.

Function of Cutaneous Muscle in the Perception of Cold. ELMER CULLER, University of Illinois.

Two active dogs were conditioned to cold: the entire forehead was shaved so as to allow direct application to the skin of flat-bottomed containers filled with mercury, either warm ($40-45^{\circ}$ C.) or cold ($5-10^{\circ}$ C.); warm being given alone, whereas cold was always attended by shock to the left paw. Permanent graphic records were made with a lever attached to the foot. After warm-cold discrimination was well established and the relative responsiveness of both sides measured, each animal was operated, one on right and one on left. The superior cervical ganglion, through which pass *all* sympathetic fibers to face and head, was carefully extirpated. As soon as possible (less than 24 hours) thereafter, each dog was repeatedly tested on either side. For 2 to 3 days after excision appeared a marked and persistent increase of responsiveness to cold on the operative side; whereupon it receded to the normal level about which it oscillated thereafter.

The experimental situation may be summarized thus: (1) The

whole sensory mechanism of the head remained intact. (2) The cutaneous (smooth) muscle within the stimulation-area was fully deprived of its normal nervous control. Concordant results for the two dogs prove, subject to confirmation, that: (1) Cutaneous muscle has a definite relation to the perception of cold, whatever their functional connection may be; (2) responsiveness of the dermal musculature is temporarily, though not permanently, modified when freed of its normal reflex control. The cold receptor is notoriously obscure. Our facts may be interpreted in two ways: (1) cold stimulation acts directly upon dermal smooth muscle, which by its contraction both stimulates the sensory terminals and also protects the body from undue loss of heat; or (2) cold acts directly upon receptors whose afferent impulses both evoke the experience of cold and also reflexly (via superior cervical ganglion) constrict the dermal musculature. The first interpretation would indicate that smooth muscle, when suddenly freed of central control, is more responsive; the second, that it is more sluggish and so permits continued egress of heat when not innervated from a central ganglion. If the first be true, the whole problem of cold-sensitivity takes a new form; if the second be correct, we have at least a real explanation of sensory "adaptation" to cold, which is commonly said to be large but is really slight. Available evidence for the two possibilities will be presented and examined.

An Experimental Study of the Effect on the Knee-jerk of Coincident Psychomotor Action. FRANKLIN FEARING, Northwestern University.

The results are reported of a preliminary study of the amplitudes of knee-jerks occurring before, during and immediately after a psychomotor response to an auditory stimulus. The psychomotor reaction took the form of a discriminatory response to one of two auditory stimuli and was designed to afford an attentional control of the reactor. The measures obtained were (1) the time of the psychomotor reaction, (2) the amount of the psychomotor reaction, (3) the amount of the coincident knee-jerk, and (4) the time of the knee-jerks. Four reactors contributed 1,751 cases. The findings may be summarized as follows: (1) facilitated or augmented kicks tend to occur when the patellar tendon is tapped after the beginning of the voluntary reaction, and (2) inhibited or diminished kicks tend to occur when the knee is tapped before and the kick takes place

after the voluntary reaction. The theoretical implications of these results bear upon the "drainage" hypothesis of inhibition, the problem of the effect of the activation of "higher" reaction systems on "lower" reflex systems and the effect of attentional control on coincident reflex actions.

The Comparative Retention Values of Maze Habits and Nonsense Syllables. JOHN A. McGEOCH AND ARTHUR W. MELTON, University of Arkansas and Yale University.

There is a current generalization that acts of skill are much better retained than are memory materials. A survey of the literature reveals no direct experimental comparison of the retention of an act of skill with that of a section of memory material. The generalization that skill is the better retained rests upon comparisons of results obtained under widely different experimental conditions. Isolated cases will be cited in which it definitely does not hold. An experiment has been performed to test the validity of this generalization in the case of mazes and nonsense syllables. The retention values, after seven days, of three mazes of different degrees of difficulty have been compared with the corresponding values of 8-, 12- and 16-syllable lists. The syllables were learned by the anticipation method. Mazes and lists were learned to one perfect trial by massed practice. This criterion gives at least an arbitrary equality in degree of learning. After seven days each was relearned to three successive perfect trials. Rigorous precautions against rehearsal were exercised. Twenty-four subjects went through the complete experiment. At any given sitting, except the first and last, the subject recalled a previously learned problem and, after a rest, learned a new problem of the other kind. Mazes and lists have equal mean positions in the series. Sub-groups were equated in sex. In terms of saving in trials, the nonsense syllables are uniformly better retained than are the mazes. This superiority ranges from 33 to 60 per cent. In terms of saving in time, neither problem is uniformly superior. Five out of the nine comparisons favor the mazes. In terms of saving in errors, the mazes excel in seven out of nine comparisons. In no case, save in trials, where the syllables are very superior, are the differences great. In terms of both errors and time, at least one syllable list is equal to or better than at least one maze. The relative retention values of mazes and nonsense syllables are functions of the particular maze and list compared, and of the score by which

retention is measured. This experiment, in which both have been learned to an arbitrary equality, finds no evidence for the generalization that motor habits are better retained than are memory materials.

A Neurophysiological Envisagement of Intelligence. LEE EDWARD TRAVIS, University of Iowa.

Correlations between the electromyographically determined patellar tendon reflex time and the ratings from various intelligence tests range from .32 for preschool children to .87 for adults. In general, with increasing age there is an increasing relationship between intelligence and rate of nervous conduction. Studies of reflex time during alcoholic intoxication and in psychiatric and neurological cases show that the highest neural levels are functional parts of the patellar tendon reflex arc. Thus the type of conduction through this arc is a fair sample of the type of conduction that takes place in the higher nerve centers as well as in the lower, and may be used as a criterion of the type of conduction through the central nervous system as a whole. The positive correlation of the rate of conduction of the nerve impulse with intelligence ratings indicates the importance of the speed of transmission of nervous energy from one reaction pattern to another or even through different parts of the same reaction pattern. A relatively high rate of conduction would afford a closer approximation of simultaneity of activity of two or more action patterns to be associated. Neurophysiologically then we may view intelligent behavior as due to the relatively simultaneous interactivity of the higher levels of the central nervous system.

PROGRAM A

SESSION FOR INFORMAL REPORT OF GRADUATE STUDENTS

THURSDAY, DECEMBER 27, 2:00 P.M.

ROOM 305, SCHERMERHORN HALL

H. L. HOLLINGWORTH, *Chairman*

Motility Studies of Sleep in Functional Neuroses. GEORGE EDWARD WEIGAND, Mellon Institute. (Introduced by H. M. Johnson.)

An Improved Pendulum Chronoscope. STARKE R. HATHAWAY, Ohio University. (Introduced by James P. Porter.)

Are there Characteristic Changes of Blood Pressure in Deception?

MATTHEW N. CHAPPELL, Columbia University. (Introduced by A. T. Poffenberger.)

An Experimental Comparison of Psychophysical Methods. W. N. KELLOGG, Columbia University. (Introduced by A. T. Poffenberger.)

Influence of the Gonads on the Sex Drive of the Albino Rat as Measured by the Obstruction Method. HENRY W. NISSON, Columbia University. (Introduced by A. T. Poffenberger.)

Configurational Response in a Chick. HOWELL LEWIS, University of Kansas. (Introduced by Raymond H. Wheeler.)

The Psychology of the Successive Comparison-Judgment. W. D. TURNER, Harvard University. (Introduced by Carroll C. Pratt.)

A Study of Conditioned Salivary Responses in Man. A. L. WINSOR, Cornell University. (Introduced by Paul J. Kruse.)

The Effect of Emotional Excitement on Rational Behavior as Demonstrated by the Quadruple-Choice Method. JAMES R. PATRICK, Ohio University. (Introduced by J. F. Dashiell.)

A Preliminary Report on the Temporal Perception of Short Intervals. MISS DOROTHY TRIPLETT, Skidmore College. (Introduced by Christian A. Ruckmick.)

ROUND TABLE DISCUSSION

PERSONALITY

THURSDAY, DECEMBER 27, 2:00 P.M.

ROOM 401, SCHERMERHORN HALL

F. H. ALLPORT, *Chairman*

PROGRAM B

EXPERIMENTAL PSYCHOLOGY

THURSDAY, DECEMBER 27, 3:00 P.M.

Room 301, FAYERWEATHER HALL

G. M. STRATTON, *Chairman*

Visual Experience and Perception of Space. H. G. BISHOP, Wittenberg College.

Visual perception of space involves the external conditions of the environment and various subjective conditions of the individual. In the dark-room the external conditions are the simplest possible because of the homogeneity of the environment. Such conditions are ideal for the investigation of the spatial properties of visual experience. Facts thus obtained would contribute to our knowledge of the genetic psychology of visual space, at the stage of perceptual development attained by the observer. The results are: (1) that an homogeneous subjective field when it arises is unstable and readily passes over into one of varying degrees of complexity; (2) that the homogeneous field, in the adult, is extended suggesting tridimensional space but is not a space of exact distances; (3) that it extends only for a short distance at the side and for a considerable greater distance in front of the observers; (4) that direction in the field is specific; (5) that oculomotor experiences apparently fuse with the visual quality largely determining the spatial character of the whole; (6) that the typical field exhibits at least two visual qualities, thus creating an object and its background subjectively; (7) that the direction of both object and background is very specific and that their distance varies from a position in which they seem to touch the face to a greater distance of several feet; and (8) that their localization is probably determined by accommodation and convergence. As an experimental variation, faint stimuli were set up in the dark in order to furnish genuine objects. The phenomena of localization were similar to the results reported above, but the visibility of these genuine objects seemed to be determined by accommodation and convergence: *i.e.*, they vanished or returned almost at the will of the observer, depending upon the motor adjustment of the eye.

Evidences of Rivalry and Reënforcement in the Visual and Vestibular Systems during Perception of Rotary Oscillation. ROLAND C. TRAVIS, Institute of Psychology, Yale University.

Rivalry and reënforcement of sensory data derived from the vestibular and visual receptors were studied by comparing the adequacy of voluntary responses to rotary oscillation of the body in the following experimental situations: (1) Coincident oscillation of an isolated visual object and the body through 2 degrees in 4, 8, and 16 seconds, respectively. (2) Oscillation of the body while the visual object was stationary. (3) Oscillation of the body without vision.

Perception of bodily motion as indicated by the reactions under condition (1) was 25 per cent better than under condition (3) and 35 per cent better than under condition (2). These findings indicate: (a) that when the visual object and body oscillated coincidentally, the visual reënforced the vestibular data in perception of bodily oscillation; (b) when the object was still and the body oscillated, vision competes with the vestibular system in perception of bodily oscillation. This follows from the fact that response without vision was more nearly adequate than with visual cues from the stationary object when the body oscillated. The introspective reports of all three subjects indicated that in condition (1) when the visual object and body oscillated together the visual object seemed to move with the body through an arc of 5° , whereas the actual movement was only 2° . In condition (2) when the visual object was stationary and the body oscillated 2° , the object seemed to move irregularly and jerkily, but not over 2° , and in the majority of the instances much less, while it sometimes appeared to be still. In condition (3), without vision, presumptively the subject appeared to be still. In condition (3), without vision, presumptively the subject depended chiefly upon vestibular cues in perceiving bodily oscillation. Theoretically, assuming that the eyes remain fixed in the head and turn with it in condition (1), the visual object might be expected to appear to remain stationary, because it moved coincidentally with the head and body, and in reference to the visual system it was fixed in space—except when the eyes moved. In condition (2) on the contrary, the visual object was stationary while the eyes are fixed on it in pursuit, by virtue of the bodily oscillation. It would be easy to assume that reflex, compensatory eye movements account for the phenomena observed in the two conditions, but preliminary analysis of eye movement records in the three conditions indicate that the phenomena as described here involve,

but are much more complex than the vestibular reflex. The cause of the phenomenon remains a problem for further investigation.

An Experimental Study of Some of the Conditions of the Visual Perception of Movement. FORREST L. DIMMICK, Hobart College.

The conclusions that may be drawn from the present experimental literature on the visual perception of movement are so equivocal that we have undertaken a reinvestigation of some of the factors that are involved in this perception. The particular conditions which we have examined are the temporal interval, the intensity of the stimulus and the attitude of the observer. In addition, we sought to add to the description of the visual carriers of the meaning movement. Our experimental arrangements were similar to those of prior investigations in this field. The observers had no acquaintance with the mechanical set-up of the apparatus or with the systematic purport of the problem. Their observational training was gained primarily in the course of this experiment. Reports were given verbally and by drawings. Our results indicate the dependence of the perception both on the temporal interval and on the intensity of the stimuli, but their influence is not as simple as Korte reported. When the attitude of the observers was shifted under instruction, his reports were completely altered. It appears from this that the conceptual term, "visual movement," is equivocal. The same significance may be carried by various patterns of experiential data. There is no universal "perception of visual movement." This makes necessary a careful delimitation of the experimental conditions and of the perceptual pattern involved.

Under a specific understanding of the term "visual movement," a "grey flash" is found to be the fundamental carrier of the meaning. This fact holds without regard to the color of the stimuli. The descriptions of the grey indicate that its source is probably Müller's cortical or central grey which is projected into the visual field under certain conditions.

The Effects of Direct Stimulation of the Blind Spot. HARRY HELSON, Bryn Mawr College.

Upon directly stimulating the optic disc by means of stimuli exposed within the projection of the blind spot and of such size that the size of image on the nerve head may be as small as $1/135$ the diameter of the optic disc, all observers report a more or less diffuse

light with a brighter core usually corresponding to the color of the stimulus. If the observer is quick enough he can catch the form of the stimulus in the first moment of exposure after which details disappear. Adaptation occurs rapidly so that weak stimuli fade out soon after exposure. Two colors exposed either side by side or as concentric circles within the blind spot can be seen simultaneously. When the region surrounding the blind spot up to its very boundaries is stimulated with light graded so that most intense stimulation occurs at the boundaries of the blind spot, thereby fulfilling the conditions of the irradiation, gradient and dispersion theories, no bright central core is reported, often nothing is seen in the region of the optic disc. If stimuli falling in the center of the disc and around its edges are exposed simultaneously, observers agree that between what is seen in the blind spot and immediately outside is dark, showing diffusion does not in this case reach beyond the boundaries of the disc to stimulate the contiguous retinal areas. Numerous experiments testing the irradiation, dispersion, and diffusion theories will be reported. It is pretty generally agreed that contrast effects, after-images, and the like show there is vision *in* the blind spot at times, but our experiments seem to show there is vision *with* the optic disc. Until concrete and verifiable meanings are given to such terms as irradiation, dispersion, diffusion, and the like, and a finer technique has been developed to measure and determine their effects, the only possible interpretation we have at present of our results is that they are due to direct stimulation of the optic disc and that alone.

The Spatial Character of High and Low Tones. CARROLL C. PRATT,
Harvard University.

The application to a given sense impression of adjectives which belong strictly to impressions from other modalities occasions, as a rule, little comment. Warm colors, soft lights, dull thuds, tonal color, heavy odors: such phrases are generally thought of as involving nothing more recondite than the mechanisms of association by similarity. But the application to tonal *pitch* of words which have to do with spatial height and depth has seemed to offer more of a puzzle. Why are tones at one end of the pitch-continuum called "high" and those at the other end called "low"? Stumpf has discovered that they are so characterized in almost every known language, and yet hearing is often referred to as the least spatial of the senses. Psychologists who have given the matter any thought have concluded that

here again some associative mechanism, strangely obscure and elusive, has been at work. They have approached the matter by insisting that tonal height and depth could not, of course, refer to positions in space, and have then proceeded, in some cases, to detailed treatment of all the possible factors which might, nevertheless, account for the conspicuous fitness of the terms "high" and "low" for tonal quality. Even Wundt and Stumpf were at one in calling these terms metaphorical when applied to tones. It now appears that the rejected explanation is very likely the correct one.

High tones are phenomenologically higher in space than low tones. Observers were asked to locate on a numbered scale running from the floor to the ceiling the position of tones coming from a Western Electric No. 2-A Audiometer. They were allowed to know that the receiver was being placed at different points up and down the vertical scale in the hope that they would thus be put on their guard against making judgments on the basis of pitch-difference which had nothing to do with space-difference. Five tones were used (256, 512, 1024, 2048, and 4096) and were presented in haphazard order at five different positions in back of the vertical scale. For every observer the tones were uniformly placed in the order, from top to bottom, 4096, 2048, 1024, 512, and 256. Not a single inversion of this order occurred. As soon as the observer gets his spatial orientation with respect to the scale his judgments are given easily and quickly and with amazing consistency.

The Range of Consonance in Certain Musical Intervals. JOSEPH PETERSON and W. F. SMITH, Peabody College.

The problem was to ascertain how far certain musical intervals in just temperament may be augmented or diminished under somewhat normal conditions without effect on the reactions of musically and nonmusically trained subjects. Edelmann tuning forks and a variable fork of closely similar tone quality were used, all being mounted on resonance boxes. The subjects were 36 college students, half of whom had had musical training extending from three to eight years (mean, 5.11 years). The other 18 S's were untrained. The forks were arranged in pairs, each including the tonic (c', 256 d.v.), so that E, holding two covered rubber mallets in the right hand, could actuate simultaneously any pair that he desired to sound. The intensity was kept down to a point not introducing beats or difference tones, and each interval was allowed to sound approximately three

seconds. In each trial E sounded in the order here given the six intervals: major second, major third, perfect fourth, perfect fifth, major sixth, and major seventh; and each of the S's, properly instructed by means of preliminary exercises, recorded on prepared sheets the one of the four consonant intervals which seemed to him "unnatural" or changed. He was not required to guess if no mistunement was noted. The mistunement was effected in each case by the substitution of a variable fork for the tonic, the former being either raised or lowered in pitch a given number of vibrations per second, according to a fixed program. Each of the four consonant intervals was altered ten times (half of the c'-notes being raised and half lowered in pitch) by these several amounts: 10, 8, 5, 3, 7, 6, 4, 2, 1, and in the order given; and twenty additional trials were given each S with no alterations in the intervals, to make sure that he was not reacting to mere quality differences in the c'-forks. This made a total of 380 judgments by each S. Most of the S's were tested individually, but in a few cases groups of not over four were tested. The S's sat about four feet away with backs turned toward the sounding forks. Results, given quantitatively in tables and graphs, show that the range of consonance of the intervals studied extends from about 4.6 to 6.2 d.v. (29 to 39 cents) each way from c'. It increases in the order: perfect fifth, perfect fifth, major third, and major sixth. The range is greater for non-musical than for musical S's, and for the latter, especially, it seems to be influenced by the equally tempered scale as a result of habituation. Improvement by practice is greater in untrained than in trained S's.

PROGRAM A

SESSION FOR INFORMAL REPORTS OF GRADUATE STUDENTS

FRIDAY, DECEMBER 28, 9:00 A.M.

ROOM 301, FAYERWEATHER HALL

H. C. WARREN, *Chairman*

Studies in the Sense of Humor of One Hundred Vassar Students.

POLYXENIE KAMBOUROPOULOU, Columbia University. (Introduced by A. T. Poffenberger.)

The Validity of Self-Estimated Academic Grades of Eleven Hundred and Sixty-five University Students. MISS INEZ VERNE LOVE, University of Pittsburgh. (Introduced by Jesse H. White.)

The Measurement of Individual Differences in Group Suggestibility. HERBERT BARRY, Harvard University. (Introduced by Carroll C. Pratt.)

An Experimental Method for Determining the Relative Efficiency of Magazine Advertisements. KEY LEE BARKLEY, University of North Carolina. (Introduced by Harry W. Crane.)

The Inheritance of Defect in General Intelligence Measured by the Method of the Individual Psychological Examination. W. D. GLENN, JR., New York University. (Introduced by Harry W. Crane.)

The Relationship of the Order of Birth to Variation in Levels of Intelligence of Siblings. J. H. McFADDEN, University of Pittsburgh. (Introduced by Harry W. Crane.)

Factors Affecting Achievement in the High School. AUSTIN H. TURNER, University of Minnesota. (Introduced by W. S. Miller.)

The Influence of Periodicity on Learning to Walk a Tight Wire. GRANVILLE B. JOHNSON, University of Denver. (Introduced by T. R. Garth.)

Intelligence Factors in Religious Training of Seventh Grade Pupils. MAE WARFIELD, Ohio University. (Introduced by J. P. Porter.)

ROUND TABLE DISCUSSION

THE FIRST COURSE IN PSYCHOLOGY

FRIDAY, DECEMBER 28, 9:00 A.M.

ROOM 401, SCHERMERHORN HALL

M. F. MEYER, *Chairman*

PROGRAM B

THE PSYCHOLOGY OF EMOTION

FRIDAY, DECEMBER 28, 10:00 A.M.

ROOM 305, SCHERMERHORN HALL

M. F. WASHBURN, *Chairman*

The Place of the Psychogalvanic Reflex in Psychology. CARNEY LANDIS, Wesleyan University.

Differences of opinion concerning the physiological basis of the psychogalvanic reflex and its psychological meaning date from the earliest work in this field. Vigouroux (1879) held that it was due to vascular tonus or state of nutrition of the tissues and might signify differences in sensitiveness of the subject. Féré (1888) found that the variations were brought about by sensorial or emotional stimulation and were coincident with the plethysmographic curve. Tarchanoff (1890) considered all mental functions as activators of the reflex and explained the phenomenon on the basis of increased sweat secretion. Most current psychological texts and monographs hold or imply that the reflex is specific to emotion or conation. The neural pathway of the reflex has been localized by Foa and Peserico. The afferent fibers travel in any sensory tract. The central control is localized in the calamus scriptorius and in the corpora quadrigemina. The efferent fibers are those of the sympathetic division of the autonomic nervous system which lead to the skin. It has been demonstrated (Gildemeister) that the reflex is a change in polarization of the cell membranes of the sudoriferous structures of the skin. These changes in polarization are controlled by the sympathetic nervous system. The electrical response (either change in apparent resistance or variation in apparent electrical output) is very closely associated with the secretion of sweat (Darrow); vasoconstriction (McDowall), the drug effect of atropine and pilocarpine (Richter), changes in CO₂ concentration of the blood (Radecki) and possibly changes in local skin temperature (Rein). All or any of these factors are under the more or less direct control of the autonomic nervous system. The reflex is not specific to emotion, conation, volition, ideation, or any traditional division of the field of psychology. The reflex is not a measure of emotivity, strength of volition, the orectic processes, introversion-extraversion, or intelligence. The reflex is (a) an indicator

of activity of the sympathetic system in the particular portion of the skin to which the electrodes are placed; (b) a fairly certain method of demonstration of general autonomic activity; (c) a method of ascertaining which psychological functions do depend in part on the autonomic component; (d) a method of demonstrating or differentiating the various components of behavior, *e.g.*, voluntary tetanic contraction, level of tonus, and activity of smooth musculature.

The Galvanic Skin Reflex, Not a Vasoconstrictor Phenomenon.

(Lantern Demonstration.) CHESTER W. DARROW, Institute for Juvenile Research, Chicago.

The recent declaration of a few writers that the electrical changes in the skin following bodily excitation are of vasoconstrictor origin may not pass unchallenged. By photokymographic records of simultaneous vasomotor and electrical changes in the same skin area, and a simultaneous blood pressure record by which selection of reactions may be so made as to eliminate a possible effect of blood pressure on volume, it is shown that there is no necessary relation between vasoconstrictor and the electrical changes of the skin, for: 1. Vasoconstriction may precede, accompany, or follow the initial rise of the galvanic curve. 2. Vasoconstriction may precede, accompany, or follow the peak of the galvanic curve. 3. The galvanic reaction may occur (a) during vasodilatation and (b) during no vasomotor change. 4. There is no correlation between the magnitude of vasoconstrictor and galvanic changes on the same strip of record. Large vasoconstrictor changes may be unaccompanied by galvanic reactions, and small vasoconstrictor changes may occur along with large galvanic deflections. 5. Graphs showing distributions of vasoconstrictor relative to electrical changes show (a) that only in a few instances does vasoconstriction begin simultaneously with or precede the initial electrical change, and (b) that initial vasoconstriction most frequently slightly precedes the peak of the galvanic curve. It is concluded that there is no necessary relation between vasoconstrictor and galvanic changes in the skin, and that certain investigators have been misled by the fact that both changes are likely to follow the same stimulating conditions. Newly acquired evidence in recent physiological literature that vasoconstriction in the larger volume controlling arterioles and venules may be accompanied by vasodilatation of the minute capillaries suggests that capillary dilatation may be the determining factor

in changes in electrical conductivity, electrical potential, and sweat gland secretion following excitation. This possibility has been experimentally approached but not conclusively demonstrated or disproved.

The Psychogalvanic Compared with Other Measures of Emotional Reactions. JAMES P. PORTER, Ohio University.

The Hathaway psychogalvanic apparatus has been used with the two groups of subjects included in the present report. Twenty-five and fifteen stimulus words have been used, the length of association reaction-time being the second measure. The cumulative error score in certain parts of a college entrance psychological examination constitutes the third measure. The fourth measure is the percentage of omissions in certain parts of the entrance examination combined with a score derived from the position of omitted items in a series. One hundred college women have served as subjects with twenty-five stimulus words. The order of presentation was such as to bring each word first in the series with four subjects. Assuming that longer reaction-times and greater excursions of the milliammeter are objective measures of stronger emotional reactions, the psychogalvanic seems a somewhat more diagnostic measure than the association times. The former gives also the more reliable difference. The reaction times are typically shorter in the forenoon. The psychogalvanic are shorter in the afternoon. The correlation between these two is $.60 \pm .086$, giving a basis for prediction of only 20 per cent better than pure chance. Work is now in progress with fifteen stimulus words with eighty college freshmen, forty of each sex. These have been selected alphabetically to make up four groups as they fall in the lowest and highest centiles, just below the median and just above the median, in the college entrance test. Most pairs of equal mental ability from the highest centile have been tested with the fifteen stimulus words and the psychogalvanic. Tentative findings would indicate that in both association-time and psychogalvanic milliamperes the men give less marked responses, weaker emotional responses, than the women. No definite statement of the emotional differences among widely varying levels of mental ability can as yet be made. Thus far our findings suggest that the psychogalvanic reveals a relatively weak emotional response in those of the lowest mental level. This would confirm earlier reports to the effect that knowledge of success or failure gave stronger emotional responses in those of higher mental level. The cumulative error scores and percentages of omission of test

items in such entrance tests as the Ohio State University, Forms 9, 10, and 12, would appear to give significant differences between the two sexes and also among varying mental levels. Just how these correlate with the other two measures used in this study we cannot yet determine. The Hathaway psychogalvanic apparatus will be demonstrated.

Why Do We Weep? FREDERICK H. LUND, Bucknell University.

With the aid of Dr. H. V. Pike, clinical director at the Danville State Hospital of Pennsylvania, studies were made of the pathological conditions associated with marked disposition to weep. Observations were also made to determine the particular stimulus combinations or circumstances most effective in producing the lacrimal discharge in normal adults. These studies make possible the following statement regarding the reaction: Tears, when affectively produced, are indicative of a mixed emotional state. Neither sorrow, dejection, joy, nor elation, when occurring in pure form, are very effective, if at all, in producing the discharge. Typically, it appears when a depressing or otherwise unpleasant situation gains a redeeming feature, or when tension and unpleasant stimulation is followed by pleasant or alleviating stimulation. This accords with the finding that the cranial nerve supply (usually active in pleasant and euphoric states) is facilitating, while the sympathetic supply (particularly active in unpleasant situations) is inhibitory. Both systems, however, are doubtless involved since action over the facial nerve (seventh cranial) is more effective when it follows a period of sympathetic activity. In these facts we may find psychological and physiological consistency in the apparent inconsistency of "crying from sorrow" and "crying from joy." In support of these statements the following facts are presented: 1. No case of weeping in the midst of a depressive psychosis was observed. A few patients, however, tended to become lacrimose when passing from a depressed to an exalted phase. 2. The pathological conditions most favorable for tears appear to be those of mild euphoria and mixed emotional states such as may occur in paresis, multiple sclerosis, general arteriosclerosis, and pseudo-bulbar palsy. 3. Paralysis of the cervical sympathetic nerves produces *increased* lacrimal disposition, while paralysis of the facial nerve causes *suppression* of tears, indicating that the normal action of the former is inhibitory and of the latter facilitating. 4. Sympathy and self-pity, as mitigating influences under depression, are highly conducive to

tears. 5. Weeping when accompanying laughter or following tension is usually initiated through an alleviating circumstance. 6. Weeping under loss is typically induced when an extenuating event or a comforting association becomes a part of the situation. 7. Weeping for joy or under dramatic and esthetic stimulation is an expression of conflicting emotional states with a dominant pleasure element.

Bodily Symptoms of Elementary Emotions. WILLIAM M. MARSTON,
Columbia University.

Previous experimentation has failed to discover identical emotional responses to the same stimulus in different subjects. Marañon found that injections of adrenalin did not cause subjects to experience emotions unless ideas appropriate to a given emotion, fear, rage, etc., were also present. These ideas could be supplied by suggestion or by previous experiences conditioning subjects to interpret sensations caused by adrenalin as dangerous, annoying, etc. These findings indicate that failure to discover predictable emotional responses results from the fact that different subjects interpret stimulus sensations differently. My own results indicate, furthermore, that the popularly named emotions, "fear," "rage," and "sex," are compound emotions, the bodily expression of which varies with the varying amounts of elementary emotions in the given compound at any moment. To produce predictable bodily symptoms of emotion, therefore, two conditions seem essential: First, a stimulus capable of evoking similar interpretations, from different subjects; second, a stimulus capable of evoking, preponderantly at least, an elementary emotion. Our problem was to determine experimentally whether motion pictures, properly prepared, might meet both conditions, and produce dependably uniform bodily changes. With the aid of motion picture producers, we selected and rearranged four film episodes, designed to evoke, selectively: compliance, dominance, inducement, and submission, four nodal elementary emotions already suggested (see *Emotions of Normal People*). We used 56 subjects, 28 of each sex, varying in age from fifteen to sixty, and varying widely in education and occupation. We tested a man and a woman simultaneously, in each case. Respiration, systolic b.p., and grip tension were recorded on all subjects while they watched the screen episodes; PGR also was secured from some subjects.

Results indicated: 1. Motion pictures can be used with fair assurance of uniform interpretation by different subjects. 2. Blood pres-

sure changes and respiration ratios for the group as a whole followed physiological predictions: compliance (b.p. drop), dominance (rise), and inducement (rise); and, less clearly, submission (drop). 3. Individual differences of bodily symptoms and verbal reports indicated that alternations occurred between compliance and dominance responses, and between inducement and submission responses, depending upon which of two leading screen characters impressed the subject most strongly; and also upon the subject's previous emotional conditioning to the actions portrayed. 4. Sex differences appeared, and also apparent differences in types divided according to color of hair and eyes.

PROGRAM A
CHILD PSYCHOLOGY

FRIDAY, DECEMBER 28, 2:00 P.M.
ROOM 305, SCHERMERHORN HALL
L. S. HOLLINGWORTH, *Chairman*

A Scale for Measuring Developmental Age. PAUL HANLY FURFEY,
Catholic University.

The test movement has provided a technique for the measurement of various aspects of growth and has led to such concepts as mental age, educational age, and so forth. Up to the present time, however, there has been no attempt to measure quantitatively the development of total personality. We know indeed that the girl who enjoys social dancing is more mature than the girl who plays with dolls, and that the boy who likes basketball is more mature than the boy who prefers tag. Various stages in this growth of the total personality have been denoted in the past by such descriptive phrases as "the age of dramatic play," "the gang age," "adolescence," and so forth. The present investigation is an attempt to replace these descriptive phrases by a quantitative measuring device. The first step was the development of a rating scale. This was used on an experimental group of seventy-five boys. By a new technique it was found possible to obtain a reliability of .94 for this scale. The second step was to devise an objective test which was then given to 450 boys. The test was very short, lasting about fifteen minutes, but it had a reliability of .76. It consisted of four parts and was concerned with play

interests, reading interests, and attitudes to various ideas. The test was validated against age and rating scale and a special scoring system was devised. In order to determine what factors might underlie developmental age the rating scale and the objective tests were given to a group of boys of known mental age, weight, and height. Partial correlations with chronological age constant were computed and it was found that mental age and developmental age had zero correlation, while physical measurements and developmental age yielded a small but positive coefficient. The conclusion drawn was that developmental age depends upon physical factors rather than on intelligence. This conclusion was confirmed by the parallelism of the curves representing pubescence and the curves representing loss of interest in certain forms of activity. It is felt that the concept of developmental age has considerable practical as well as theoretical importance. For example, a study of the causes which underlie the formation of boys' gangs showed that developmental age played a greater part than did any other measurable factor.

A Quantitative Study of the Eye Reflexes in Infants. MARTHA GUERNSEY, University of Michigan.

These results represent some preliminary experiments in a genetic study of vision which, combined with embryology and histology, may throw more light on the developmental phases of attention and perception. In general, the attempt was made to standardize, quantitatively, the observations of Pfister, Magitot, Peiper, and others, with regard to pupillary reactions, correlation of eye movements, lid reflexes, foveal and peripheral sensitivity, and other related phenomena. Twenty-five infants were observed, ranging in age from eight hours to six months. The principal apparatus was a standard differential pupiloscope. General results include the following: 1. The average size of the pupil increases in small increments with chronological age. In the newborn infant it averages .7 to 1.0 mm., increasing within the first six months to 1.3 mm. The average size in the adult is recorded by Peiper as 2.5 mm. 2. The rapidity of pupillary expansion and contraction is markedly less for the young infant than for the adult. Six examples of extremely slow contraction without discoverable stimulus changes are recorded in infants under two months. Five subjects show simultaneous differences in the width of the pupils. 3. Uncoördinated right-left movements of the eyes occurred in 60 per cent of the children under two weeks, whereas only 30 per cent occurred at six weeks. One case was

observed at four months and twelve days. With the exception of this subject, there was no consistent dominancy of either eye. Only three instances of uncoördinated eye and lid movements were observed, all under sixty hours of age. 4. Blinking reflexes occur in 80 per cent of the cases, but only in response to contacts or intense light stimuli. 5. As fixation is lacking well into the second month, it is difficult to determine differences in foveal and peripheral sensitivity. At three months, however, preferential sensory adaptation (turning the head, eyes, or whole body) occurs to a light stimulus placed at 50 degrees from a similar stimulus placed equidistant in the visual median plane. Histological evidence of the changes in lens curvature and dioptric strength in the young infant seems to correlate with these facts in supporting an empirical theory of space perception.

The Resemblance of Identical and Fraternal Twins in a Variety of Traits. FRANK N. FREEMAN (with the collaboration of KARL J. HOLZINGER and H. H. NEWMAN), University of Chicago.

The distinction between identical and fraternal pairs was made in collaboration with Dr. H. H. Newman, the well known student of the biology of twinning. The distinction was based wholly on physical traits. A combination of physical characteristics was used for the diagnosis, the most significant being finger and hand patterns. The scheme of diagnosis was carried much beyond methods previously used. By this method fifty pairs of identical and fifty pairs of fraternal twins were selected. To avoid any possible effect of sex differences only twins of the same sex were studied. Beside some observation of superficial physical traits, a series of physical measurements and of physical, mental, and educational tests were given. The primary object is to determine the degree of likeness of the two types in the various traits. A secondary object is to discover whether, by comparing the differences between the traits, any light can be thrown on the question how far the resemblances can be ascribed to inborn tendencies or to environment. There seems to be some indication that some of the traits are more subject to environmental influence than others, although in most cases the identical twins are much more closely alike than are the fraternal twins.

The Influence of Maturation on Infant Behavior Pattern. ARNOLD GESELL, Yale University.

Pressed to undue limits, the problem of the rôle of maturation in the determination of patterns of infant behavior becomes meta-

physical. It is possible, however, to subject the general problem to preliminary analysis for the purpose of defining investigatory issues. The term growth may be construed to embrace the total complex of ontogenetic development. Maturation refers to those phases and products of growth which are wholly or chiefly due to innate and endogenous factors. In the study of animal behavior these factors can be pursued with some thoroughness. In the field of human behavior they can be searched for in significant developmental sequences in both normal and atypical subjects. Unusual etiological conditions provide data of an experimental character. In identical infant twins the influence of maturation can be subjected to partial experimental analysis by conditioning one twin and using the other as a control. The results of such an experimental study of infant twins will be briefly reported. Genetic changes in the pattern of prehension in infants 20, 24, 28, 32, 36, and 40 weeks of age are outlined to indicate the underlying rôle of maturation. Further data as to the stability and scope of maturation are reported from studies of prematurity, postmaturity, and motor disability. The naturalistic aspect of emotional behavior is briefly discussed.

The Relative Potency of Form and Color Perception at Various Ages. FLORENCE L. GOODENOUGH, Institute of Child Welfare, University of Minnesota.

In an attempt to ascertain whether form or color plays a major part in the total apprehension of an object by individuals of a given age, an experimental situation was devised in which the subjects were required to choose between two alternatives in matching a series of geometrical solids and surfaces of different colors. Either form or color might be matched, but never both simultaneously. A total of 474 subjects, ranging in age from children under two years to adults, were used. Exceedingly marked age differences in the relative potency of form and color as indicated by the matching were found; and statistical treatment showed that these differences are highly reliable. Children below the age of three years exhibit a very marked tendency to match upon the basis of form rather than color. At about the age of three, a preference for color begins to manifest itself. Color is matched in preference to form by each half-year age group between the ages of three and six years. By the age of six form has again become the predominating factor in the situation, and the proportion of form as compared to color choices increases steadily from six

years to the adult level. The "peaks" in the curve occur at the ages of two to two and a half, when 84 per cent of the choices are made upon the basis of form and only 16 per cent on the basis of color; at four to four and a half, when 75 per cent of the choices are made on the basis of color and only 25 per cent on the basis of form; and at the adult level, when form accounts for 90 per cent of the choices and color for only 10 per cent.

The results of this experiment are in close agreement with those previously obtained by Descoudres, when similar age groups are compared. Since the Descoudres experiment included only one child below the age of three years, and grouped together all cases between the ages of three and six years, the form of the development curve for the early years was not clearly defined. It is believed that the early predominance of form over color perception is here shown for the first time.

ROUND TABLE DISCUSSION
CONSCIOUSNESS AND BEHAVIOR

FRIDAY, DECEMBER 28, 2:00 P.M.
ROOM 401, SCHERMERHORN HALL
R. M. OGDEN, *Chairman*

PROGRAM B
ANIMAL PSYCHOLOGY

FRIDAY, DECEMBER 28, 3:00 P.M.
ROOM 301, FAYERWEATHER HALL
K. DUNLAP, *Chairman*

Primacy and Recency Factors in Animal Motor Learning. C. J. WARDEN, Columbia University.

The problem as to whether or not the laws of primacy and recency operate in any important way in serial animal learning situations of the maze type has led to considerable discussion because of the contradictory nature of the evidence. As the present study shows, the lack of agreement in the results obtained by previous investigators

appears to be due, largely if not wholly, to failure to standardize experimental conditions so as to isolate the primacy-recency factors. In most cases no adequate control has been had of even the basic matter of settling a problem in which the units of the serial pattern are genuinely comparable in difficulty. The present paper reports the results of an experiment in which this factor has been controlled and special care taken to avoid emotional effects that might enter in to mask possible primacy-recency factors. Results were secured on five serial patterns differing only quantitatively in an additive series (2-4-6-8-10 unit patterns). Since the method employed is analogous or even identical to that employed in testing for primacy-recency effects in connection with human verbal material, the present findings would seem to be of considerable theoretical importance relative to the possibility of an extension of the laws of primacy and recency to serial learning generally.

An Unexpected Cue in Maze Learning. JOHN F. SHEPARD, University of Michigan.

In connection with an extensive study of the factors involved in learning various maze patterns, it became evident that the animals (rats) were using some cue which had not been brought under control. The particular maze pattern concerned in the experiment here reported consisted of a number of like or standard units followed by an exceptional unit in which the reaction necessary to avoid the blind was precisely opposite to that necessary in the standard units. The rats learned the maze easily. Then when they were inserted at various points in the standard unit series they were able, after a brief period of exploration, to orient themselves accurately and locate the exceptional unit with almost no errors. This demonstrates that the standard units were not alike to them, that they obtained some differential cue either from within or without the maze. The maze was illuminated by 100 small shaded lights, 24" o.c. in each direction, which was also the width of the maze pattern units. There was then little chance for a visual cue, and numerous tests showed that the cue was not visual, olfactory, or kinesthetic-tactile (in the usual sense at least). The maze platform is 2" thick and is covered with a sort of asphaltic linoleum 3/16" thick and cut into 12" squares. Interchange of these flooring sections caused serious disorientation of the animal. When such floor coverings were removed from a portion of the maze and the platform covered with $\frac{1}{2}$ " hair felt, then a soft rubberized sheeting, and over all a good quality of black percale, the rats

behaved as though in an entirely strange situation. On this flooring they were able to learn only one (or at the most, two) standard units followed by the exceptional unit, and were unable to regain orientation if the routine were departed from. The flooring furnishes a very important cue which is, in all probability, of auditory character. This fact has necessitated a repetition of a number of maze patterns with this factor under control. We shall also apply the suggested technique to the general problem of audition in rats.

Effect of Endocrine Substances on Memory Habit in the Rat.
WALTER MILES, Stanford University.

These tests on the effects of various endocrine substances, *e.g.*, adrenalin, insulin, pituitrin, have been made by injecting small doses in animals that have already learned an elevated maze involving eight choices. An animal was given one trial on the maze ten to twenty minutes before injection, and then following injection he was given two trials, one while the substance is active and one later, when he has returned to near normal. Results are presented for both blind and sighted adult animals. The blind normally exhibited rather less vigor, that is, poorer physical condition, than the sighted, but both groups were without deficiency diseases. Injection of normal saline solution produces no observable change in the function of the memory habit. The endocrine substances studied up to the present (October, 1928) produce observable changes in the gait, posture, motor coördination, and exploratory tendencies of the animals. These changes are similar for both blind and sighted. They do not function to cause the animal to complete the maze more rapidly or more accurately. On the contrary, adrenalin in very slight dosages causes slower progress in the maze (periods of hesitancy, which may be interspersed with a few fairly rapid steps), more frequent loss of orientation (retracing or entering blinds). Doses of insulin, although creating a greater immediate demand in the organism for food, does not function to the end that the animal goes to the food more promptly, although he eats ravenously when he arrives. These endocrine substances for normal animals interfere with the efficiency of the memory habit. The results are presented in tables and charts.

The Age Factor in Rat Learning. C. P. STONE, Institute for Juvenile Research.

Comparable age groups of rats were trained at various ages beginning with late infancy (twenty-five days), at various stages of

adult development, and at the beginning of the period of senescence (two years or over). Problem escape boxes, mazes, and light discrimination apparatus were used to provide the learning problems. Although some of these problems differentiate the animals on the basis of age, the chief points of difference appear to result from factors other than sheer learning ability.

The Problem of the Insoluble Maze. W. S. HUNTER, Clark University.

Inasmuch as discrimination problems may be made too difficult for the rat to solve, it would seem possible to find insoluble maze problems also. This is particularly true if completed maze behavior is a series of stimulus-response units. It should be possible to arrange a combination of stimuli within the maze and to control the external environment in such a manner that the problem could not be solved. One should not seek to make the maze insoluble through the use of excessive length of pathway or through the use of punishment in the true path. Although instances are on record of individual rats who could not learn a given maze, Hunter's double alternation temporal maze is the only insoluble maze so far devised for rats. In an effort to bridge the gap between this maze and the typical two-dimensional spatial maze, work has been in progress with a three-dimensional double alternation maze. With this maze in a heterogeneous environment and with twenty-three normal rats, the first perfect run was made on the forty-eighth trial. Only one rat had learned the problem at the close of fifty-eight trials, and twenty rats had never made one perfect run in this time. (Three perfect trials in succession were required.) The simple alternation three-dimensional maze is readily learned both by normal and by blind rats. So far in the attempt to understand the factors making for learning and for the sensory control of the maze habit, investigators have used a maze that could readily be learned and have then varied first one factor and then another. The present program starts with an insoluble maze. The analysis of such a problem and the determination of the factors which must be introduced before learning can occur should materially advance our understanding of the sensory control of complex behavior.

ANNUAL DINNER

FRIDAY, DECEMBER 28, 6:30 P.M.

HOTEL PENNSYLVANIA

ADDRESS OF THE PRESIDENT

THE PSYCHOLOGY OF CONTROVERSY

E. G. BORING

HARVARD UNIVERSITY

FRIDAY, DECEMBER 28, 8:00 P.M.

HOTEL PENNSYLVANIA

PROGRAM A

ANIMAL PSYCHOLOGY

SATURDAY, DECEMBER 29, 9:00 A.M.

ROOM 301, FAYERWEATHER HALL

R. M. YERKES, *Chairman*

Preliminary Results of a Physiological Analysis of Learning. H. S. LIDDELL and O. D. ANDERSON, Cornell University.

From the physiological point of view positive and negative acquired responses are regarded as involving processes of excitation and inhibition in the cerebral hemispheres and one attempts to infer from the interaction of these positive and negative conditioned reflexes the locus, intensity, and duration of cortical excitations and inhibitions. Some preliminary results of this type of analysis of learning in the sheep are given below. The sheep was chosen as the experimental animal because of its long life span (twelve years) and its docility. The defensive reaction evoked by the application of an electric shock to the foreleg was employed in developing various conditioned reflexes. In the early stages of reflex formation the motor response involves almost the entire skeletal musculature. However,

with repetition of the shock, preceded by the conditioned stimulus, both conditioned and unconditioned reflexes become concentrated in space and time until both reactions consist of brisk, precise movements of the foreleg. In the development of discriminative and delayed conditioned reflexes cerebral inhibition is believed to be involved. Beating of the metronome presumably activates a definite group of nerve cells in the auditory area of the cortex and in the discrimination experiments a rate of 120 beats per minute was accompanied by a shock, while with 60 per minute no shock was given, so that this metronome rate was presumed to have acquired inhibitory properties. As a result, the same group of nerve cells may be regarded as sometimes excited and sometimes inhibited. The developing discrimination broke down when the positive rhythm succeeded the negative several times after intervals of two to four minutes and the animal showed signs of nervousness. The cause of this disturbance might be the conflict between the waning inhibition persisting after the negative stimulus and the excitation in the same cells aroused by the positive metronome rhythm. The delayed reaction was developed by continuing the sound of the metronome for a definite time before the shock. The delay was successfully lengthened to thirty seconds, but at this point it disappeared and the animal became extremely nervous. Theoretically, this disruption of the equilibrium between excitation and inhibition may be regarded as caused by the demand for more inhibition than the nerve cells could supply, on the assumption that the longer the delay the more intense the cortical inhibition.

Relational Thinking in Monkeys. HEINRICH KLÜVER, Behavior Research Fund, Chicago, Ill.

The problem of relational thinking in the field of visual perception was investigated with Rhesus monkeys. The animals were trained to react "positively" to one of two stimuli differing in brightness or some other characteristic. In "critical" trials stimuli differing in many respects (size, color, shape, surface texture) from the stimuli used in the training experiments were presented under conditions different from those during the training period. The reactions of the animals to these critical stimuli were tested. The characteristics of the stimuli capable of evoking the same motor response as set up during the training are examined and the factors influencing the constancy of the motor response are discussed. The conclusions reached with regard to "relational functions" in the visual field are

confirmed by experiments on successive comparison of weights in Rhesus monkeys. The methods employed in the collection of data can be also used in studying Cebus monkeys, cats, and preschool children.

The Conditioned Response and "Acclimatization to Stimuli" in Animals. GEORGE HUMPHREY, Queens University.

According to Pavlov, repetition of a conditioned stimulus tends to build up a state of inhibition causing the gradual disappearance of the response, the function of the unconditioned stimulus being merely to retard the development of the inhibition. Degeneration of response has been observed after repetition of the (harmless) stimulus calling forth the protective response in many subhuman forms from the unicellular up. Piéron and Parker attribute certain of these cases to the effects of inhibition, and it is possible that in at least some of them Pavlov's mechanism is at work. If this were so, there are certain peculiarities we should expect to find; in particular it should be possible to restore the reaction not only by lapse of time but also by applying an extraneous stimulus. Two species were selected in which the protective response appears not to have been explored, viz., the land snail and the turtle. Snails (*helix albolabris*) were placed on a ball-bearing platform, to which could be electrically administered a longitudinal jerk at fixed time intervals, providing a constant and measurable mechanical stimulus despite the animal's locomotion. Protective withdrawal at first regularly followed the stimulus, but disappeared on repetition. It reappeared when a steel ball was dropped on the platform. The turtles (*aromochlemys odoratus*) were stimulated mechanically on the shell every two seconds by the stroke of an electric bell hammer. Records were made showing (a) the latent period, the average of ninety-six determinations to date being 83 sigma, with apparently a tendency to increase on repetition; (b) the disappearance of the response by continued stimulation; and (c) its reappearance after extraneous stimulation. Slight extraneous stimuli appeared often to delay disappearance, as also reported by Pavlov. The hypothesis is therefore suggested that at least in the instances investigated the disappearance of the protective response and the "extinction" of the conditioned response involve a common mechanism, and that such *ad hoc* descriptions as "adaptation" and "acclimatization" are unnecessary. The phenomenon examined primarily involves modification of response following stimu-

lation of one external receptor field only. It is further suggested that the underlying mechanism is a primitive component of learning, which as generally studied involves stimulation of at least two external receptor fields.

Selective Adaptations of Chimpanzees. HAROLD C. BINGHAM, Institute of Psychology, Yale University. (Lantern.)

Apparatus, as it has been devised and used by the author for studying the adaptive behavior of chimpanzees, is illustrated with lantern slides. The problem devices which will be shown on the screen include the slot box, endless rope, and intersecting channels for transportation adjustments; the revolving arm for pursuit adjustments; and boxes for translocation and transformation adjustments. This apparatus has been developed to give the anthropoid subject opportunity to demonstrate use of the selective principle.

Performance curves are presented as evidence of selective adaptation in a problem presented by a moving lure attached to the revolving arm. There were nine reaction areas from which the chimpanzee might reach for the lure. The observer decided whether or not the course and speed of the lure had been anticipated, and made the appropriate record of success or failure. Results are shown in a graph.

For comparison with this evidence of anticipatory position, successful "hits" and "catches" are also shown graphically. These data are based on more arbitrary criteria, since the subject missed, hit, or caught the moving lure. Differentiation appears between anticipatory adjustments indicated by the subject's selection of reaction area, and achievement in which manual skill is also involved. The mechanical factor, as an obstacle in quantitative demonstration of insight, is thus concretely shown.

A Comparison of the Behavior of Human Subjects and Chimpanzees in Similar Controlled Situations. W. E. BLATZ, University of Toronto. (Lantern.)

Means have been devised to duplicate as closely as possible with human subjects the problem, situations, motivation, and facilities for solution used by Koehler with chimpanzees. Children from two to five years of age attending the St. George's School have been selected for preliminary study. A cage of bars has been built on a low stand in which candy, a biscuit, or a piece of fruit is placed. These objec-

tives can only be reached by the use of two rods (jointable) placed in front of the cage. Twenty-eight children have completed the first stage of the experiment. Their approach to the situation is very much like the apes', except for their use of language, which is very significant for an analysis of the learning situation. There seems to be no correlation between performances and chronological age or mental age within the range of our subjects. The use of similar "tools" at home has been verified of most of the children, but their performances with the cage does not seem to indicate any special gestalt "pattern." There is always continued success when once a subject has been successful. Moving pictures are to be taken for purposes of examining the activities more thoroughly. Quantitative evaluation of the behavior (which was not done by Koehler or Yerkes) has been attempted in terms of frequency of attempted types of solution, amount of distraction, types of vocalization, amount of muscular activity, etc. Our preliminary exploratory procedure is being refined and elaborated.

ROUND TABLE DISCUSSION

PSYCHOPHYSICAL MEASUREMENT METHODS

SATURDAY, DECEMBER 29, 9:00 A.M.

ROOM 401, SCHERMERHORN HALL

E. G. BORING, *Chairman*

PROGRAM B

MENTAL TESTS AND MEASUREMENTS

SATURDAY, DECEMBER 29, 10:00 A.M.

ROOM 305, SCHERMERHORN HALL

J. McK. CATTELL, *Chairman*

The Standardization of a Point Performance Scale. GRACE ARTHUR,
Child Guidance Clinic, St. Paul, Minn.

This work was subsidized by a small grant made by the Commonwealth Fund through the Psychology Department of the University

of Minnesota. The test included in the two parallel forms of the scale were selected upon the basis of their ability to discriminate between successive chronological age groups from five to fifteen years, inclusive. Of the performance tests described by Pintner and Paterson, the following were included in *Form I*: Knox Cube, Seguin Form Board, Two Figure, Casuist, Mannikin and Feature-Profile, Mare and Foal, Healy Picture Completion I, Porteus Maze. To these were added Kohs' Block Design Test. *Form II* is made up of the following: Knox Cube (reverse order), Seguin Form Board (inverted), Triangular Test, Five Figure Form Board, Ship Test, Healy Picture Completion II, Maze (horizontal position), Kohs (inverted). Each test is weighted automatically according to its discriminative value. Crude scores are changed to point values in terms of P.E. Total point scores are changed by table into years and months of mental age, and these, in turn, into I.Q.'s in the usual manner. About 1,100 public school children were used in standardizing each form of the scale. Chronological age norms were obtained for *Form I*, retest norms for *Form II*. Mental age norms and sex norms are available for both forms of the scale. The P.E. between chronological age ratings on *Form I* and retest ratings on *Form II* ranges from 4.86 at the nine-year level to 8.24 at the thirteen-year level. The performance scale is of value in a psychological clinic: (1) To confirm the Binet rating. The P. E. (Nygaard's formula) between the Kuhlman-Binet and *Form I* of the performance scale is 4.95 for 76 cases. That between the Stanford-Binet and *Form I* is 4.92 for 119 cases. (2) To take the place of a Binet rating, in cases of foreign language handicap, extreme speech defect, deafness, etc. (3) To supplement the Binet rating in cases where there is a significant difference between verbal and nonverbal abilities. Jewish children tend to rate higher on the Binet than on the performance scale. Italian children tend to rate higher on the performance scale. (4) To serve as a shock absorber in situations where a valid Binet rating could not be obtained without it.

The Significance of the Ratio Maintained Between the Forward, Reverse and Rhythmic Memory Span as Obtained in Three Thousand Individual Examinations. ANNA SPIESMAN STARR, New Brunswick, N. J.

A critical analysis of the memory span scores obtained in the individual examinations of more than 3,000 white children of school age at the Municipal Court of Philadelphia demonstrates that not only are

there definite unimodal norms for each chronological age level of each diagnostic group, but also that a definite ratio exists between the score values obtained. Digits were used as stimulus units presented in an even tone and at a definite rate—except in the rhythmic. The results confirm those of a former study, sustaining the superior diagnostic value of the reverse span as a single score, and further indicate its peculiar value in the study of maladjustment. (Charts showing general distribution in normal and subnormal cases. The diagnosis in each case was based upon a complete psychological, physical, neurological, and psychiatric examination.) A constant ratio is evident between the forward and rhythmic span of the individual. In 70 per cent of all the cases, the rhythmic span equalled the forward increased by one digit (X and X plus 1). The ratio between the reverse and the forward span is equally persistent, and in 70 per cent of the cases may be expressed as Y and Y minus 2, when Y equals the forward memory span mode for the corresponding age and diagnosis. It appears evident that the memory span elicited in any given instance portrays and reflects the confunctioning of a particular complexus of abilities. Vary the mode of presentation with any particular individual and the response varies accordingly, but it remains true to the mode characteristic of the procedure employed. Keep the procedure constant and the individual responses will fluctuate within narrow limits, but maintain the characteristic mode for age and development. This ratio is an index of a functioning complexus—basic in the life of the individual. Those cases which varied from the X and X plus 1 and the Y and Y minus 2 ratio, presented corresponding abilities or deficiencies in their daily behavior and further reflected such deviations in the performance of other psychological tests. (Illustrative cases.)

A Technique for Determining an Objectivity-Subjectivity Ratio for Scales of Measurement. Preliminary Study. HENRY F. ADAMS, University of Michigan.

Current definitions of objectivity are scrutinized and it is found that the "objective" tests are objective in none of the more usual meanings of the word. The appeal is therefore to experiment, the working basis of which is as follows. If a number of admittedly objective scales are used, analysis of the results may reveal one or more constant trends. If a number of admittedly subjective scales with as nearly as possible the same technique and method, analysis of the results may reveal one or more consistent trends. If the

trends are the same for both objective and subjective scales, the experiment will disclose nothing of value. On the other hand, if certain trends hold consistently for objective and not for subjective scales, and vice versa, the differences may be considered to be significant and definitive. Fifteen experiments with objective scales were conducted. Five series of weights, ten weights to the series, were arranged in order of weight twice by 120 subjects. Five series of lines, ten lines to the series, were arranged in order of length twice by 70 subjects. Five series of circles, ten circles to the series, were arranged in order of size twice by 70 subjects. By correlating the order assigned by each subject in his first trial with that assigned on the second trial, and averaging, the self-consistency is determined. By correlating the order assigned by each subject with that assigned by the other subjects, and averaging, group consistency is determined. By correlating the order assigned by each subject with the true order, and averaging, the accuracy is determined. With objective scales, self-consistency equals group consistency inside the limits imposed by the P. E. The accuracy is the square root of the consistency, inside the limits imposed by the P.E. The admittedly subjective scales used in the experiment included personality ratings, advertising appeals, tests of aesthetic appreciation, tests of humor, and tests of interest. Each subject arranged the items of each test in order of merit twice. The results show that self-consistency is invariably higher than group consistency. Accuracy is the square root of the group consistency when accuracy is defined as consensus of opinion. When real accuracy and consensus of opinion do not agree, the correlations based on real accuracy are no longer the square root of the group consistency.

Conclusions: 1. The relative amounts of objectivity and subjectivity in a scale may be determined by dividing group consistency by self-consistency, thereby giving a ratio which will range between 1.00 and 0. 2. The square root relationship existing between group consistency and accuracy may be useful in throwing light on the validity of the scale. When the relationship does not hold, the scale, at any rate, is not valid.

Preferences and Self Ratings. EDNA HEIDBREDER, University of Minnesota.

The study is an attempt to discover whether or not there is a close relationship between self ratings on selected personality

traits and preferences for those traits. Two sets of traits were studied: (a) those commonly considered characteristic of introversion, and (b) those considered characteristic of the inferiority complex. Three sets of ratings on these traits were secured from 125 subjects; the first set indicating the degree to which the subjects possessed the traits in question, the second (obtained two weeks later) the degree to which they would *like* to possess the traits; and the third (obtained after another interval of two weeks) the degree to which they liked the traits in others. On the basis of the second and third sets a scoring key was made for measuring social desirability in the traits listed. Scoring keys corresponding to the generally accepted concepts of introversion and the inferiority complex had been worked out previously. The results show only a chance relationship between scores on social desirability and preferences for socially desirable traits, but an appreciable positive relationship between scores on a particular temperament (introversion or the inferiority complex) and preferences for that temperament. For example, individuals who indicate marked preferences for socially desirable traits may or may not possess those traits according to their self ratings; whereas individuals who indicate preferences for traits characteristic of introversion or the inferiority complex are somewhat likely to possess those traits, according to their self ratings. Apparently there is a tendency for possession of and preference for a given kind of temperament, as indicated by ratings, to occur together; but no such tendency appears when the traits are considered from the standpoint of social desirability. However, even where positive relationships occur, there are marked differences in central tendency between ratings indicating possession of and preference for the traits considered. This is true of ratings on introversion, the inferiority complex, and social desirability. Significant sex differences appear in ratings indicating preferences for traits, but not in ratings indicating possession of the traits.

A Statistical Study of the Responses to the Individual Tests in the Stanford-Binet for Examiners of Different Chronological and Binet Ages and Diagnostic Groupings. J. E. W. WALLIN and MARGERY GILBERT CUTSFORTH, Miami University.

Analysis has been made of the responses of 1,382 consecutive clinic cases to the Stanford-Binet tests from age five to twelve when grouped in four ways, most important of which are: (1) according

to Binet age, both irrespective of diagnosis and according to three major diagnostic groupings (normal, subnormal, and mentally defective), the median chronological age being computed for the attempts and successes in each Binet age; and (2) according to chronological age, both irrespective of diagnosis and according to the major diagnostic categories, with the median Binet age computed for attempts and successes.

Only major results for the eight-year tests will be reported, confined mainly to a comparison of the performance of normals, subnormals, and mental defectives having a Binet eight-year level. Among such results are: 1. The large difference between the easiest (comprehension questions) and the hardest test (ball-and-field), amounting to 31.2 per cent. 2. Enormous individual differences exist, *e.g.*, some Binet four-year olds passed the comprehension test, while some Binet twelve-year olds failed. 3. Consistent improvement in all tests occurs with increasing Binet age, while increasing chronological age brings both negative and positive results. 4. On the basis of the arbitrary standard adopted of 66 per cent of passing for age placement, the similarities (for all brightness groups), reversed digits, and vocabulary tests approximately fit age eight. The other tests are misplaced. 5. The relative difficulty of some of the tests differs greatly for the different diagnostic groups (of the same Binet age). Hence, psychological test findings are affected markedly by the intelligence level and relative brightness of the groups tested. Tests standardized on "unselected" groups may be misleading because the group was weighted with sub- or super-average children. Differences sometimes found in tests "standardized" on presumably "unselected" groups may be because one group was weighted with inferior children, another group was weighted with superior children, while a third group may have contained unusually few dull or bright children.

PROGRAM A

ABNORMAL PSYCHOLOGY

SATURDAY, DECEMBER 29, 2:00 P.M.

ROOM 305, SCHERMERHORN HALL

J. JASTROW, *Chairman*

Tests of Reaction-time and Motor Inhibition in the Psychoses. S. ISAACS and E. B. SAUNDERS, University of Rochester Medical School, and Sheppard and Enoch Pratt Hospital.

The specific problem of this investigation was to determine: (1) whether there is a significant difference, that might be used for diagnostic purposes, in the average time of reaction of various types of psychotic subjects as compared with the normal, and (2) whether there is a significant difference in the degree or type of variability in the reactions. A supplementary investigation on "Motor Inhibition" was undertaken with a type of performance involving in a sense the opposite behavior attributes from those at work in the reaction-time test. While there is some evidence of difference of behavior between the psychotic and the normal revealed in the performance in the tests used it is not sufficiently positive in kind or degree to recommend the tests as standard and objective means of detection of abnormal behavior or its diagnosis. The observation of the behavior of the psychotic subjects during the test and on the ward and other considerations suggested by the results of the tests recommend the use, as advocated by Dunlap, of a "condition-measurement" rather than of "capacity tests."

A Theory of Hysteria. CURT ROSENOW, Institute for Child Guidance, New York City.

In a general way the connection of hysteria with emotion is well recognized, but there has been little articulate thought about the processes by means of which emotions become transmuted into symptoms. After a brief critique of Freud and Janet, I utilize Kretschmer's account of the development of the hysterical tremor as a point of departure. As "normal" trembling ("normally" induced), subsides, a vague voluntary emotional impulse increases slightly the (relevant) muscular tonus. Consequently trembling is reinstated. As the reaction becomes habitual, the patient forgets about his col-

laboration. Consequently the tremor seems to be independent of his volition. Kretschmer accounts for all the motor symptoms in similar fashion, but finds it necessary to invoke other concepts for the explanation of the other facts. With certain changes Kretschmer's account can be made to explain all of the facts. The individual does not *understand* that the tremor might be utilized as a means of escape, but he *perceives* the tremor in that way. He does *not* tense his muscles voluntarily, but he remembers (*e.g.*) a terrible incident which reinstates the trembling. After that he is more and more likely to think of terrifying incidents and these "thoughts" become more and more fragmentary as to content and efficacious in maintaining the tremor. Summing up and generalizing, the hysterical symptom is a resultant of the emotional behavior of the individual in ways which the individual does not understand. This formula was arrived at in my paper on hypnosis. The development of somnambulism furnishes a key to the understanding of many symptoms which it is impossible to review in twenty minutes. Here also the individual *perceives* as a means of escape organic reactions occurring "spontaneously" and these reactions become habitual. Hypnagogic behavior and modified fainting spells are utilized most frequently. Janet's Irène is *not* able to remember her mother's death "because the memory is dissociated"; she does remember, and as she does she faints. Multiple personalities are characterized by a transition state distinguishable from sleep by anesthesia and analgesia. This transition is sleep surcharged with emotion. Emotion superimposed upon hypnagogic behavior explains anesthesia, analgesia, and amnesia in a manner analogous to the one suggested in my paper on hypnosis. Analgesia results because the response to the stimulus is a reënforcement of the activity of maintaining the symptom. Amnesia for actual events is the maintenance of the symptom.

The Aetiology of So-Called Congenital Word-Blindness. WALTER F. DEARBORN, Harvard University.

Morgan in 1896 used the term "congenital word-blindness" to describe the case of a boy of fourteen who was not mentally defective, whose vision was said to be normal, but who could not learn to read. The publication in 1917 of Hinshelwood's observations consolidated the opinion that this condition was due to defective embryonic development of the cerebral centers for the visual memory of letters and words. Despite the fact that this notion has long

been out of line with current conceptions of cerebral physiology, it has persisted in one form or another in medical and psychological literature. Family "trees" or genealogies of word-blindness, extending back into the fourth and fifth generations, have been described. There is doubtless some factual basis for these descriptions, an analysis of which may have theoretical as well as practical interest. In 1925 the writer described a number of sensory and motor factors associated with this condition emphasizing especially the possibly causal relationship of left-handedness and "left-eyedness" and the associated valence or preference for right-left movement of hand and eye, as observed in mirror writing and reading. In the same year Orton, although noting the possible presence of other causal factors concluded that "the factors of reversals of individual letters and the tendency to sinistral reading of letter groups or whole words seem to characterize all of these cases." Orton has also given what appears to be an adequate account of the difficulty in terms of brain physiology. The present paper describes the operation of a second factor, the imbalance or insufficiency of the eye muscles (heterophoria) which, even in degrees generally considered by ophthalmologists to be "within normal limits," appears to cause confusion in word recognition and reversal of letters. The symptoms are thus similar to those appearing in cases where manual or visual dominance has not been established. Further they are consistent with the cerebral hypothesis of Orton and may also be described by the term "stereosymbolia" which Orton has proposed to replace that of congenital word-blindness.

Emotion and the Incidence of Disease: The Number of Diseases, and the Age at which They Occur. GEORGE M. STRATTON, University of California.

Further study strengthens the evidence, earlier reported, that disease is connected in after-life with a heightened irascibility: that persons who have been subject to disease tend to be more intensely angry than do persons who have been free from disease. Further, the range of diseases incurred is significant. There is a cumulative connection between anger and disease: persons who have had a greater number of diseases appear to be more irascible than do those who have had fewer diseases. And finally, the time at which the disease occurs is important. Persons who have suffered disease in the first five years of their lives appear in general to respond more

intensely to anger situations than do persons whose diseases came later. The evidence throughout is far more doubtful with regard to fear. There are faintest indications that an occurrence of disease is followed by a lasting tendency to a heightening of fear, and that the greater the number of diseases the stronger is this tendency. In these respects the relation of fear to disease seems to be like that of anger to disease. But with respect to the life-period in which there was the morbid attack, the uncertain evidence appears to point in a direction opposite to that for anger: the stronger fears seem to occur, not in those whose diseases came in early childhood, but in those whose diseases came at a later period of life.

Mental Deterioration. G. V. N. DEARBORN, U. S. Veterans' Hospital, The Bronx, N. Y.

After a few words of orientation and definition, it is briefly pointed out in this paper that a regressed mental process is still a mental process and proper material for study by even the "academic" psychologist. The behavior-units of *affective* mental regression are well understood by the numerous varieties of "social psychologists" and by the psychiatrists, but largely because antisocial behavior is still, in the lay-mind, the chief criterion of psychosis, as it is of crime. The physical basis of affective regression is just over the horizon amid an intricacy of autonomic neurones, smooth muscle, and endocrines. We need some sort of a higher viewing to unravel the tangle. Our chief concern this time is with deterioration, regression, dilapidation of "the *intellect* proper" whatever that is,—plainly only an aspect of the same process as "the *affect*." Little analysis of intelligence regressed ever has been attempted, so far as the reader is aware, perhaps because of a lack of a method of doing it as well as from the absence of interest therein—psychologist and psychiatrist still are so far apart! The present modest offering itemizes a dozen or so directions of intellectual deterioration as they have been discriminated by him during nearly four thousand personal applications of scales, especially the Binet-Terman, but always in an intensive way, to normal and to regressed adults. Careful analysis shows that each type of deterioration or of regression has characteristics more or less peculiar to itself. The work gets part of whatever problematic interest it may have from its certainty of differentiation between intellectual deterioration, on one hand, and feeble-mindedness and constitutional inferiority on the other hand. Now that the neuro-

pathology of these states is becoming plainer and more certain, there is more satisfaction than formerly in discussing them. As was pointed out of old, in concepts of the mental process "qualitative" and "quantitative" lose the meaning they have elsewhere, and we now begin to see why. The evidence supports the inevitable monistic hypothesis, and seems to advance, no matter how little, our understanding of the nature of minds and our appreciation of our bodies, the acme of evolution. The writer of this report is a pleader for the closer acquaintance of psychology and psychiatry to their great mutual advantage.

ROUND TABLE DISCUSSION
PSYCHOLOGY OF ESTHETICS

SATURDAY, DECEMBER 29, 2:00 P.M.
ROOM 401, SCHERMERHORN HALL
H. S. LANGFELD, *Chairman*

PROGRAM B
EDUCATIONAL PSYCHOLOGY

SATURDAY, DECEMBER 29, 2:00 P.M.
ROOM 301, FAYERWEATHER HALL
E. L. THORNDIKE, *Chairman*

Habits of Sustained Effort. E. M. RIDDLE, John Burroughs and Community Schools, St. Louis, Mo.

A study has been made of the habits of sustained effort shown by high school pupils during a period of more than a year. Estimates of the degree to which each pupil sustained his effort in dealing with the four school subjects, English, Latin, French and mathematics, were made by the teachers of the respective subjects. These estimates were recorded in the last quarter of the school year 1926-27 and in the first and third quarters of 1927-28. Estimates were also made of the pupil's interest in these subjects and his desire to succeed in the work. The rest of the data used in the investigation was

collected from the regular records kept by the school. This material has been analyzed to throw some light on the following questions: 1. How does effort vary throughout the school year? Is effort greater at one time of the year than at another? 2. Is the effort applied to school work the same for all subjects? 3. What relationship is there between the effort put forth and the achievement attained in each subject? 4. Does effort vary according to the mental maturity of the pupil? 5. Does the pupil, more advanced chronologically, maintain his effort more effectively than those younger than himself? 6. What relationship is there between interest in the work and the effort put forth in dealing with it? 7. Is the desire to succeed in school work accompanied by a comparable degree of effort exerted in the work?

On the Effect of Tactual-Visual Stimulation in Relation to the Interpretation of Speech. ROBERT H. GAULT, Northwestern University.

Out of eighty-six scores comparing the success of 54 deaf persons individually as lip-readers and as lip-touch readers, 77 show the advantage of lip-touch reading. The stimuli in approximately one-half the cases were 100 isolated monosyllabic words. The remainder were sentences that contained 20 trisyllables, 80 bisyllables, and 925 monosyllables. The results in all cases reported here are based upon the number of words recognized. Ratios of lip-touch-reading scores to lip-reading scores are shown. The median ratio when the stimuli are isolated words is 1.3. When the stimuli are sentences it is 1.2. Hypothesis: the tactual experience, in its own right, contributes language cues. A suggestion that the tactual stimulus assists merely as accessory or as distracting stimulation is not supported in preliminary experiments that have been and others now in progress. S., a totally, and congenitally deaf twenty-five-year-old subject made a score of 47 as a straight lip-reader without distraction in 100 reactions. In a distraction series while S. was attempting to "lip-read" from Experimenter A, another Experimenter, B., was reading *unrelated sentence* stimuli into the teletactor in the hand of S. Score, only 30 per cent. The same subject, tested for lip-reading and lip-touch-reading made 39 per cent and 51 per cent, respectively, when 100 isolated words were presented as stimuli. When 436 words were presented in 50 sentences, the score was 48 per cent and 61 per cent on lip-reading and lip-touch-reading, respec-

tively. It is not just the distribution of accent, emphasis, pauses and tempo (when sentences and continued discourse are used as stimuli) that turns the scales for lip-touch-reading. For in preliminary experiments, three subjects have made tactual identification among four *like-patterned sentences* with a good degree of success. The results are 72 per cent, 62, and 80 per cent. These figures are based upon 100 reactions to each of the four like-patterned sentences. What does touch afford by reason of which spoken language is interpreted better under dual stimulation than in straight lip-reading? Reactions to homophenous words and other data indicate that the feel of some consonants and of some vowel and diphthongal qualities, in addition to the feel of gross pattern, furnishes cues that are missed by the eye.

Timing as a Factor in Athletic Skills. COLEMAN R. GRIFFITH,
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Only a few of the studies in the field of learning have drawn a sharp distinction between the *form* of a skill, that is, the pattern of muscular movement that is to be perfected, and the *rate* at which this particular form or pattern of movement is to be executed. Where "rate at which" has been considered at all, experimenters have asked their subjects to learn to perform a given task at maximal speed. The attainment of a maximal speed is taken either as a criterion of learning or as a sign that the subject has reached his "practical limit." In certain types of athletic skill a sharp distinction must be drawn between the form or pattern of a skill and the rate at which the skill is to be exercised. There is one standard of excellence for the form of a movement and another for the rate at which the movement must be exercised. This rate may not be a maximal rate. It is an optimal rate. By means of a modification of the Carr slot maze, these phases of habit have been put under experimental control. Two factors of habit or skill reveal themselves, viz., the time, the pace, the "rate at which," and the form, the pattern, or the mode of muscular efficiency. The research shows that timing is learned more slowly than form of movement and is forgotten more quickly. It looks also as though many cases of "practical limit" in learning are due to the early development of a "rate at which" which is established during the attempt to learn the pattern or form of a movement. Further progress, even in speed,

is hindered by the fact that the learner has to break down a timing habit he has already acquired.

The Relative Influence of Practice vs. Motivation on Learning.

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This experiment attempts to determine the relative influence of repetition and motivation on learning. Correct English usage was chosen as the subject matter to be learned. The Charters Diagnostic Language Tests, slightly modified, were selected as material. These tests (form 1) were given before and after practice and learning was measured by the gain in score. Practice material, consisting of form 2 of the Charters test with all of the sentences corrected, was used by having the class read the sentences aloud and in unison. The experiment was divided into three parts. Part I—the nonmotivated—classes took the tests and used the practice sheets with no incentive of any sort. The four tests in the Charter series were interspersed with one, three, five and ten repetitions, respectively, of the practice sheets. In Part II—the test-motivation-classes—the tests were used for purposes of self and individual competition. Pupils were told the scores on the first test in each case and were urged to try to improve on the final tests. Three repetitions of the practice material were allowed between each set of tests. In Part III—intrinsic-motivation—an attempt was made to interest the children in improving their own use of English by talks by the principal, by reading passages showing the value of using good English and answering questions on these passages, and by class discussions. Three repetitions of the practice material were allowed between first and final tests. *Results.* There was an increase in the gain on the tests with added amounts of practice. The learning shown by the intrinsic motivated groups was identical with that made by the nonmotivated groups with three repetitions of the material, indicating that this form of motivation has no influence over and above practice. The test motivation groups showed additional gain over and above practice which is the equivalent of about five repetitions of sheer practice.

Discussion. The findings are discussed under such topics as the function of motivation, the distinction between intrinsic motivation in which the situation is *experienced* and that in which it is *described*, and the most effective type of motivation.

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